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Company Limited



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(NEMA Registration No. 0197)

STUDY REPORT

THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR LAMU - NAIROBI EAST 400KV TRANSMISSION LINE

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DISCLOSURE

This Environmental and Social Impact Assessment Study Report is hereby Disclosed for public review as follows:-

Proponent: The Kenya Electricity Transmission Company –KETRACO

Assignment: The Environmental and Social Impact Assessment Study for the proposed 400 Kv Double Circuit Line: Lamu-Nairobi East.

Firm of Experts: The African Nature & Environmental Conservation Trust- ANECT- NEMA
Registration No. 0197

We, ANECT, on behalf of KETRACO, declare that to the best of our knowledge and belief, all information contained in this report is accurate and a true representation of our findings as related to the project.

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Date.....

LIST OF ACRONYMS

AAAC	All Aluminum Alloy Conductors
ACSR	Aluminum Conductor steel Reinforced
AEZs	Agro-ecological zones
ANECT	African Nature & Environmental Conservation Trust
ASALs	Arid to Semi-arid Lands
CBOs	Community Based Organizations
CR	Critically endangered
DSM	Demand Side Management
EIA	Energy Information Administration
EMCA	Environmental Management and Coordination Act
EN	Endangered
ERC	Energy Regulatory Commission
ERC	Electricity Regulatory Commission
ESIA	Environmental and Social Impact Assessment
ESIS	Ecological Site Information System
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
GDC	Geothermal Development Company
GIS	Geographic Information System
GoK	Government of Kenya
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
IPPs	Independent Power Producers
IUCN	International Union for the Convention on Nature
KCAA	Kenya Civil Aviation Authority
KEFRI	Kenya Forestry Research Institute
KENGEN	Kenya Electricity Generating Company
KETRACO	Kenya Electricity Transmission Company
KFS	Kenya Forest Service
KPLC	Kenya Power and Lighting Company
KV	Kilovolt
kWh	kilowatt hour
KWS	Kenya Wildlife Service
L-NE OHTL	Lamu-Nairobi East Overhead Transmission Line
MoE	Ministry of Energy
MTP	Medium Term Plan
MW	Megawatts
NEMA	National Environmental Management Authority
NGOs	Non-Governmental Organization
NMK	National Museums of Kenya
OHL	Overhead power line
OHTL	Overhead Transmission Line
OPGW	Optical Ground Wire
Osha	The Occupation Safety And Health Act
PPA	Power Purchase Agreements
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
REA	Rural Electrification Authority
ToR	Terms of Reference

TRPR

Tana River Primate Reserve

UNESCO

United Nations Educational, Scientific and Cultural Organization

US

United States

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EXECUTIVE SUMMARY

Overview of electricity generation and transmission in Kenya

The Government of Kenya is currently putting massive investments in the energy sub-sector in order to meet the 5,000+ megawatts target of electricity supply to all parts of Kenya by 2017. The on-going projects therefore, are aimed at diversifying power generation from various sources such as geothermal, solar, hydroelectric, coal and wind. Explorations for electricity generation from natural gas, especially from recently discovered gas in Northern Kenya are also being pursued to boost the country's power base to meet ever growing demand for electricity utility.

The Government's medium term strategy goal is to increase access to electricity in Kenya tenfold from the current 4% in the rural areas to about 40% by 2020. Towards realisation of this strategy, a major upgrade and expansion of the national power transmission grid is underway and has been given new impetus by the incorporation of the Kenya Transmission Company-KETRACO. The Kenya Electricity Transmission Company-KETRACO, which is mandated by the Government of Kenya to manage bulk power transmission of electric power currently controls the national power transmission network comprised of 1323 km of 220 kV, 2085 km of 132 kV and 632 km of 66kV transmission lines.

Purpose of proposed project

The Lamu-Nairobi East Transmission Line project using coal will add about 1000 MW electricity capacity to the national grid (currently standing at 1,664 MW) as part of meeting the Government's target of 5000+ megawatts to the national grid by 2017. This additional electricity to national grid will add up to the Government's effort to scale up access to electricity in Kenya from the current 4% in the rural areas to about 40% by 2020 as a key enabler to economic growth, industrial development and improvement of social welfare development and social pillars of Vision 2030.

Objectives of the ESIA

- To undertake an environmental and social impact assessment (ESIA) for the proposed project
- To ensure the proposed project's compliance with the EMCA Act of 1999 and its Regulations based on Environmental Impact Assessment and Audit guidelines of 2003
- To understand anticipated environmental impacts from the proposed project and suggest appropriate mitigation measures
- To guide in making decision for sustainable management in respect to the proposed project
- To develop an environmental management and monitoring plan for the proposed project.

Project benefits

The Lamu-Nairobi East Transmission Line will enhance the reliability and stability of electricity supplied through the national grid by injecting into the grid electricity to be generated at Lamu coal plant.

Furthermore, the new Transmission Line will facilitate improvement of energy infrastructures, expansion of new electricity generation and also enhance the development of transmission network to match the country's demand.

Other benefits include:

- Provision of significant portion of electricity to the National grid to propel major drivers of economic growth and social development.
- Provision of domestic energy supply and use in small-scale businesses, access to electric power for schools, micro-small enterprises rural and urban enterprises in agribusiness, livestock, saw mills and joineries, grain mills and other agricultural processing and storage businesses among others.
- Enhance the Government plans to rolling out ICT sector to all parts of the country hence; improve computer based data management together with communication facilities such as the internet and charging of mobile phones especially in rural areas among other benefits.
- Improve security at night and enables extended opportunities for work
- Improvement in the general quality of life through among others according business and economic opportunities to unemployed especially youth, women and men across all parts of the country.

Project location

The overhead transmission line (L-NE OHTL) will traverses five Counties of Lamu, Tana River, Garisa, Kitui and Machakos covering a distance of 520 Kilometres.

Design and technology

The main consideration in the design and technology to employ in implementation of the project is safety, cost-effectiveness and reliability while observing international, national and regional regulations. The main components to be used include; conductors, overhead earth wire (OPGW), supporting structures, foundations, insulator strings, circuit breakers, lightning arrestors and dampers.

Project activities

The main project activities in the construction phase of the project will be the construction of proposed transmission line. The support structures (pylons) will be erected, and conductors and insulators suspended.

The operational phase of the project will include maintenance of way leaves, inspections and repairs. The pylons will require little maintenance but will be routinely checked to protect them from vandalism. The way-leave will throughout be kept clear of vegetation.

The project is a long-term and therefore, no decommissioning is envisaged in the near future. However, site offices will be brought down and construction materials carted away after the completion of the construction phase of the project.

Project budget

The estimated budget for the project is Kshs. 315, 374,000 only.

ESIA Project study approach

The process of the ESIA study approach and methodology employed comprehensive consultation and participation of various relevant institutions and public to ensure all inputs and comments are incorporated to ensure sustainable implementation of the project at all phases (during construction, monitoring and management) are sustained and embraced by all stakeholders and

public in general. Specifically, the following processes were adopted in fulfilment of the requirements of the study's Terms of Reference:

- A comprehensive Environmental and Social Impact Assessment for all aspects of the L-NE OHTL undertaken in pursuant to the relevant National and International Laws and Regulations ;
- Obtaining of easement of land granted that some of the construction of the line will be on land that is not necessarily vested with the proponent;
- Raising of public awareness and partnership before and after the project implementation;
- Submission of Draft Project Report to NEMA and obtaining Approvals of the Terms of Reference for the study;

Methodology used in undertaking the ESIA Study

The general methodology for addressing all identified issues of the ESIA study were guided by the scope of work, objectives and expected outputs indicated in the Terms of Reference (ToR). The ESIA approach and methodology employed both quantitative and qualitative approach in collection of data and analysis structured within the framework of existing policy and legal aspects and components of environmental, ecological, social and biodiversity requirements of the ESIA study.

In particular, the ESIA methodology underpinned upon the relevant Clauses of the EMCA 1999, the EIA Regulations (2003) as stipulated under the Gazette Notice No. 56 of 13th June 2003, and other national and international legislative and policy safeguards applicable in assignments of this nature and magnitude. Specific study techniques and approaches employed included: consultative and participatory approach; document review; baseline screening, environmental scoping; key stakeholder interviews, public participation, analysis of social and environmental issues and impacts including elucidation of the environmental management plan, and compilation of the ESIA report.

Summary of the ESIA Study Findings

Baseline biophysical conditions

The L-NE OHTL transverses wide geographical areas with altitude close to sea level (11 m at Lamu) to areas that have an altitude of about 1800 m at Matungulu, Machakos County. Soil in the study area vary from sandy to clayey, shallow to very deep and low to high fertility.

The proposed transmission line will pass through 4 agro-ecological zones namely VII, VI, V and IV which range from very arid, arid to semi-arid. The L-NE OHTL traverses three (3) rainfall regimes. These are 600-800mm at the coastal strip of Lamu, 400-600mm in the Ijara to Masalani area, and 200-400mm in the dry zone Tana River County. The Embakasi area falls and the adjacent Matuu areas fall in the regimes of 600-800mm and 400-600mm respectively. The vegetation types vary from bushland, woodland, shrubland to shrub grassland. In general the dominant woody species starting from the driest zones were *Acacia recifens/A. horrida*, *Dobera glabra*, *Salvadra persica*, *Commiphora africana*, and *Acacia senegal*. As for grasses the dominant species were *Themeda triadra*, *Cenhrus ciliaris* and *Chloris roxburghiana*. Near the coast, dryland tropical forests dominate. Based on the baseline survey, the following observations are made:

- The OHTL will not traverse areas designated as National Parks or Reserves,
- Therefore, the project will not pose any significant impact on fauna or biodiversity of habitats in protected areas. Designated animal protected areas near OHTL include; Mwingi North Wildlife Reserve,

- The OHTL poses no threat to species or habitats when analysed against available data on threatened species and habitats.
- The OHTL will cross Tana River and Athi River riverine wetlands but given that it (TL) is designed to pass several meters above the ground it will pose no significant threat to the wetland areas and land use activities of residents.

Baseline socio-economic conditions

The 520 Kilometer L-NE OHTL traverses a wide variation of ecological, climatic and socioeconomic zones that determine human settlement based on land use and natural resources such as water, soil and vegetation patterns. For example, the study observed that over 89.3% of the populations through which the TL traverses derive their major socioeconomic livelihoods from livestock keeping (goat, sheep, cattle, camel, donkeys and poultry), while, the rest of the land use is used for small-scale irrigation (along the banks of Tana River, Athi River and small streams) including trade in urban centers.

The line has avoided as much as possible areas with potential higher impacts in terms of population and destruction of property for instance: settlement schemes, urban areas and heavy vegetation cover. The population distribution in terms of numbers and density is higher in Nairobi East including Machakos and Kitui counties and sparse in Tana River, Garisa and Lamu counties respectively. The people in areas in Nairobi East especially Koma Rock, Kithimani, Kantafu and majority of Locations in Yatta and Matungulu (Machakos County) and in parts of Kitui practice agriculture, trade and livestock, while the in Tana River, Ijara and Lamu livelihoods revolve around livestock, with cattle, sheep and goats, camels and donkey dominating the socioeconomic activities.

Lamu presents a rich combination of ecosystem with diverse flora and fauna including unique historical and cultural heritage spanning many centuries ago. These rich characteristics made Lamu Island classified by UNESCO as a World's Heritage Site among few other unique ecosystems in Kenya. Based on the baseline socio-economic conditions, the following observations are made:

- Over the last few years, land speculation in Lamu County has attracted an influx of new land settlers with small-scale agriculture becoming a source of socioeconomic livelihoods in the area.
- The OHTL has been designed to avoid the graveyards identified in churches in Machakos at Kavaa
- The OHTL has also been designed to avoid interfering with ancient cultural Swahili structures at Lamu,
- There will be need to ensure that trees such as *Dobera glabra* and *Chassalia umbraticola* found at Hindi Sub-county Lamu within the proximity of the OHTL are preserved. During public meetings at Buthei and Bargon the residents stressed their cultural and ritual attachments with the above mentioned trees,

Summary results of public participation

Table1. Below summarizes key issues raised during the public participation forums.

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
Kormarock location. Matungulu sub-county. Machakos county.	Individual ownership although title deeds are yet	-Displacement of people from their land. -Immorality due to concentration of project	Business opportunities should be supported

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
	to be issued.	workers in small places. -Marriage breakages -Business boosted. -Employment for Youth and adults. -Additional value of the land due to the power boosting. -Additional electricity power	The contractor should source for labour from the locals. Land compensation
Syokithumbi location. Matinyani sub-county. Kitui county.	Individual ownership with free hold title deeds	-Displacement. -Immorality. -Marriage breakages -Business increase. -Employment. -Additional electricity power. -Easier access to electricity.	Source employment from the local community.
Chuluni division. Kyanika location. Mwembe tayali sub-location. Nzambani sub-county. Kitui county	Individual ownership with free hold title deeds	-Displacement. -Immorality. -Marriage breakages -Employment opportunities. -Additional electricity power. -Easier access to electricity.	Source employment from the local community. Better storage of agricultural produce, butcheries and other business.
Ijara sub-county. Masalani location. Garissa county.	The land is community ranch.	-Insecurity due outside and not well-known people coming to work on the project. -Immorality. -Culture interference. -Business during the construction of the line and after due to increased power. -Easier access to electricity. -Employment of the local during the implementation of the project.	Employments opportunities opened. Business will be Boosted as traders will sell at night too. Schools and hospitals will be connected to electricity.
Ijara sub-county. Ijara location. Garissa county.	The land is community ranch.	-Insecurity due outside and not well-known people coming to work on the project. -Immorality. -Culture interference. -Business during the	Employment opportunities for Youth and adults from the project. Business will be boosted and traders

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
		<p>construction of the line and after due to increased power.</p> <ul style="list-style-type: none"> -Easier access to electricity. -Employment of the local during the implementation of the project. 	<p>such as hotels, butcheries and shops will operate even at night.</p> <p>Security will be boosted.</p> <p>Schools will be connected to electricity and boost educational system in the County.</p>
<p>Hola sub-county. Titila location. Tana river county.</p>	<p>The land is community ranch.</p>	<ul style="list-style-type: none"> -Insecurity due outside and not well-known people coming to work on the project. -Immorality. -Culture interference. -Business during the construction of the line and after due to increased power. -Easier access to electricity. -Employment of the local during the implementation of the project. 	<p>Security will be boosted</p> <p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p> <p>Employments.</p> <p>Business will be boosted and traders such as hotels, butcheries and shops will operate even at night.</p> <p>Schools will be connected to electricity.</p>
<p>Hola sub-county. Wayuboro location. Tana river county.</p>	<p>The land is community ranch.</p>	<ul style="list-style-type: none"> -Insecurity due outside and not well-known people coming to work on the project. -Immorality. -Culture interference. -Business during the construction of the line and after due to increased power. -Easier access to electricity. -Employment of the local during the implementation of the project. 	<p>Security will be boosted.</p> <p>Employment opportunities.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p>
<p>Lamu county.</p>	<p>The land is</p>	<p>-Insecurity due outside</p>	<p>Security will be</p>

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
<p>Hindi sub-county. Hindi magogoni location. Bargon sub-location.</p>	<p>community ranch.</p>	<p>and not well-known people coming to work on the project. -Immorality. -Culture interference. -Business during the construction of the line and after due to increased power. -Easier access to electricity. -Employment of the local during the implementation of the project. -Destruction of old trees which are variable to the community as some have medicinal values.</p>	<p>boosted. Employments opportunities will be opened for Youth, Women and men. Business will be boosted. Tourism will be opened up for local people to venture in. Schools will be connected to electricity and boost educational systems in the County. Employments. Better storage of agricultural and livestock products (butcheries and other business.</p>
<p>Lamu county. Hindi sub-county. Hindi magogoni location. Hindi magogoni sub-location.</p>	<p>The land is community ranch.</p>	<p>-Insecurity due outside and not well-known people coming to work on the project. -Immorality and associated risk. -Culture interference. -Business during the construction of the line and after due to increased power. -Easier access to electricity. -Employment of the local during the implementation of the project. -Destruction of old trees which are variable to the community as some are medicinal.</p>	<p>Employments. Business will be boosted. Schools will be connected to electricity.</p>

Summary of Predicted significant impacts and mitigation

The tables 2, below presents potential significant impacts and key proposed mitigation measures.

Potential negative impact	Key mitigation measures
Clearing of vegetation and loss of biodiversity	<ul style="list-style-type: none"> • Compensate by planting of trees on roadsides and avenues and in other public places such as schools. • Undertake selective clearance to target only tall trees and shrubs and avoid clearance of short annual herbs. • Adhere strictly to prescribed dimensions in clearing of vegetation.
Hazard to fauna including bird strikes	<ul style="list-style-type: none"> • Desist from any form of hunting of game for trophies or food • Erect perching platforms on top of pylons • Monitor number of electrocuted birds and those lost to collision and compare with published data to made decision on effectiveness of measures taken
Noise and dust pollution	<ul style="list-style-type: none"> • Obtain necessary authorization if blasting is to take place • Provide appropriate PPEs to workers (dust masks and noise mufflers) • Supervise workers to ensure they work away from drifting dust
Impeded drainage leading to soil erosion into water resources	<ul style="list-style-type: none"> • Plan construction to coincide with dry weather • Minimize use of heavy equipment by favouring human labour • Monitor soil erosion levels and compare with published data for need to undertake additional corrective measures
Wetlands	<ul style="list-style-type: none"> • Design L-NE OHTL route to cross wetland perpendicularly to minimize impact
Solid waste generation	<ul style="list-style-type: none"> • Proper quantification of requirements to avoid redundancies of ordered materials • Use of high quality, long lasting and well maintained electrical equipment materials
Electric and magnetic fields (EMF)	<ul style="list-style-type: none"> • Installation of transmission lines to avoid residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or hospitals) • Taller double circuit poles resulting in less of a magnetic field at ground level.
Visual intrusion	<ul style="list-style-type: none"> • Create public awareness before construction of pylons • Where feasible use the hilly terrain to locate pylons in a way that will mask the visual intrusion
Land acquisition and disruption of social economic setup	<ul style="list-style-type: none"> • Implement a resettlement assessment plan • Expedited compensation
Interference with cultural heritage	<ul style="list-style-type: none"> • Determine and protect sites through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5
Occupational safety and health concerns, including	<ul style="list-style-type: none"> • Adhere to stipulations of the OSHA 2007 during construction and operation

Potential negative impact	Key mitigation measures
electrocution	
Risk to low flying planes	<ul style="list-style-type: none"> • Mark the wires to international standards to warn low flying planes
Increased cases of vandalism	<ul style="list-style-type: none"> • Engage the public to report vandalism through use of manned hotlines • Rapid response to deter any reported cases of impeding vandalism
Fire outbreaks	<ul style="list-style-type: none"> • Maintain the way-leaves free of fire fuel

Environmental monitoring program

An elaborate environmental, social management and monitoring plan has been developed on the basis of identifies impacts and schedule of activities drawn for tracking and mitigation of the impacts. Monitoring actions have been specified and documented for mitigation of negative impacts and amplify positive impacts to be generated by the project. The objective of the environmental and social monitoring plan is to guide on the time frame for actions to be taken into consideration while allocating responsibilities across key players and stakeholders at all phases of the project implementation.

At the onset, KETRACO will conduct regular internal monitoring of the project to audit direct implementation of environmental mitigation measures contained in the ESMMP. KETRACO will subject the project to third party environmental auditors whenever its internal auditor detects major non conformities or in case of major unforeseen catastrophes. KETRACO will also every year engage external auditors to prepare an environmental audit and submit the same to NEMA.

PROJECT BACKGROUND AND JUSTIFICATION

1.0. Overarching strategic power generation and transmission issues

The Kenya Vision 2030 identifies Energy as a key foundation and a major infrastructural “enablers” upon which Kenya’s economic development, social and political advancements are anchored. Towards realization of the Vision 2030 on energy sector, the Government strategy is to enhance expansion and diversification of new power sources generation, transmission and supply of electricity to the majority of consumer’s country wide. However, currently reports indicate that less than 20% of the total population and approximately 95% of rural population have no access to electricity, meaning that many efforts are needed to fast track power supply systems to improve the general quality of life and support business and economic opportunities to Kenyans across all parts of the country.

Kenya’s National Energy Policy aims at facilitating the provision of clean, sustainable, affordable, reliable and secure energy services at least cost, while protecting the environment. The efforts come alongside a critical time for Kenya’s quest for economic growth and promotion of social welfare of over 40 million Kenyans that heightens the demand for energy far above the current capacity. The current supply, although increasing slowly, cannot keep up with demand. In response, the Kenyan government is using three policy tools to facilitate the adoption of renewable energy. The key strategy of energy policy and medium to long-term plans are geared towards: i). Increased country’s energy supply; ii). Close the energy demand gap and; iii). Ultimately enables economic growth and social welfare for Kenyans.

To address the above power disparity, the Government is poised to accelerate access rate electricity to 20% (from 5%) of rural population by 2010 and to at least 40% (from 20%) by 2020, towards achieving the above goal, the Government has prepared the Energy Scale up Program covering the period 2008 to 2017, whose strategy focused on addressing the following three key areas of implementation in medium term perspective: i). improvement of energy infrastructures; ii). Expansion of new electricity generation and; iii). Development of transmission network to match the country’s demand.

The above overarching three approaches have an interdependent relationship that in improving power generation and transmission capacity simultaneously while new power generation plant translates to investment in transmission while investment in transmission lines also attract money more investments for new power generation plant, thus resulting in faster expansion of electricity supply in the country to meet ever growing demand.

1.1. Status of power generation and transmission in the country

According to the Government Blue print, the National consumption of electricity was projected to rise from 4.9 billion kilowatt hours in 2003/2004 to 5.1 billion in 2004/2005, and 6.9 billion kilowatt hours in 2009/2010 and expected to 11.8 billion by 2020.

Recent reports indicate that less than 20% of the total population and 5% of the rural population in Kenya has access to electricity, meaning that the access gap between supply and demand in terms of power generation, transmission and supply on average is significantly wide. The high electricity demand in Kenya has been exacerbated by high use of mobile communication technology where almost half of population in all parts of the country use mobile phones for business, social and other forms of communication. Furthermore, as mobile technology becomes a part of Kenyan culture and Nairobi positions itself as the technology hub of East Africa, demand is growing fast for electricity from both on- and off-grid consumers.

The World Bank report (2009 on the status of electricity supply in Kenya undertaken covering a period of 10 years (1980-2009) indicated that overall electric production in Kenya has increased at 5% per year since 1980, while consumption of electricity per capita has only increased at 1.2% per year during the study period. This means that although the supply registered an overall increase of 5% this was insignificant compared to high individual demand for electricity. The report further identified the following as main causes of Kenya's low consumption of electricity per capita: i). high population growth (average 3% per years); ii). Inefficiencies that exist on the grid such as: transmission losses, theft, undiversified sources, and prohibitively high costs for infrastructure development among others. There is also an additional challenge of reinforcing the power supply to already electrified areas/towns/regions aiming at least-cost technical solutions that offer a combination of increased capacity, improved reliability and better voltage control.

In implementation of the Vision 2030, the Government has embarked in putting massive investments in the energy Sub-Sector in order to meet the 5,000+ megawatts target of electricity supply to all parts of Kenya by 2017. The on-going projects therefore, are aimed at diversifying power sources generation which include: geothermal, solar, hydroelectric, coal and wind. Explorations for electricity generation from natural gas, especially from recently discovered gas in Northern Kenya are also being pursued to boost the country's power base to meet ever growing demand for electricity utility.

1.2. Mandate and Objectives of KETRACO

The Government projections indicate that power demand will reach 18,000 MW by 2030 from the current capacity of about 2000 MW. In fulfillment of the Jubilee Government Manifesto on energy provision, the Government has undertaken to deliver 5000+ megawatts to the national grid by 2017, therefore, the current improvement in the transmission lines network being undertaken by KETRACO in various parts of Kenya will not only increase reliability and improve power quality in the country but also enhance the realization of the Government's projection of power supply in line with Vision 2030 strategy.

The Kenya Electricity Transmission Company-KETRACO is the Utility Company established by the Government of Kenya with the mandate to develop new high voltage electricity transmission infrastructure that forms the backbone of the National Transmission Grid, in line with Kenya Vision 2030. Its core business is to plan, design, build and maintain electricity transmission lines and associated substations. The voltage rating of the transmission lines include 132kV, 220kV, 400kV and 500kV (HVDC).

In implementing its mandate, the Company, over the last three years embarked on developing new and robust grid system for electricity transmission across the country towards achieving the following results: i). Improving quality and reliability of electricity supply throughout the country; ii). Transmitting electricity to areas that are currently not supplied from the national grid; iii). Evacuating power from planned generation plants; iv). Providing a link with the neighboring countries in order to facilitate power exchange and develop electricity trade in the region and v); Reducing transmission losses that currently cost the country heavily every year and; vi). Reducing the cost of electricity to the consumer by absorbing the capital cost of transmission infrastructure

The L-NE OHTL 400 KV Double Circuit Transmission Line project is part of KETRACO's long term and medium term plan that aim at constructing over 4,000 km. of high voltage transmission infrastructure comprising of lines, switch gears and sub-stations across the country in the next 3-4 years. This move will open up geographical areas without access to the national grid, enhance capacity for evacuating power from planned generating plants and build inter-connectors to facilitate regional power trade with neighbouring countries. The transmission development plan

indicates the need and intention to develop approximately 10,345 km of new overhead lines to facilitate meeting the Government's target for energy supply in the country.

1.4. Project and Justification

The L-NE OHTL, will add about 1000 MW electricity capacity to the national grid (currently standing at 1,664 MW) as part of meeting the Government's target of 5000+ megawatts to the national grid by 2017. The injection of this huge amount of electricity supply to the national grid will not only facilitate the Government's projection to scale up access to electricity in Kenya tenfold from the current 4% in the rural areas to about 40% by 2020, but also play a significant role as a key enabler to economic growth, industrial development and improvement of social welfare development and social pillars of Vision 2030.

The project will further enhance reliability of electricity supply crucial to Kenya's economic development and realisation of the Vision 2030. Although Kenya has a fast growing electricity sector with an installed capacity of approximately 1100 MW, the electrification rates, are still low currently less than 15%. The annual per capita consumption is about 145 kWh. This consumption is growing fast which is good for economic development. However, due to the fast growth, power shortages and unreliability has been common. This situation is characterized by voltage drops and voltage fluctuations beyond acceptable levels, which again create frequent black-outs and blown-outs.

The country power cost per unit is also not competitive due to limited installed capacity. Hence, injection of about 1000 MW to the existing supply will facilitate reduction of cost of power and the multiplier effect will be felt in virtually all factors of production (agriculture, labour productivity, improved business and production costs, ICT among others).

As part of power diversification solution, the Government is in the process of building a coal electricity generating plant in Lamu. The giant plant will have a capacity to generate more than half of the country's current electricity consumption. The Lamu power plant will initially use imported coal, and later convert to use of locally developed coal from Mui Basin, Kitui County. As part of implementing the project, KETRACO has therefore designed the Lamu-Nairobi East 400 KV double circuit transmission line to tap into the national grid the electricity generated at Lamu coal plant- a distance of 520 Kilometre.

1.4 Projects Benefits

Apart from providing significant portion of electricity to the National grid to propel major drivers of economic growth and social development, on micro-level, other specific benefits include:

- Reliable and secure power supply for domestic energy supply and use in small-scale businesses,
- Direct and indirect non-skilled employment opportunities
- Gains in the local and national economy and increase
- Access to electric power for schools, micro-small enterprises rural and urban enterprises in agribusiness, livestock, saw mills and joineries, grain mills and other agricultural processing and storage businesses among others,
- Access to power will enhance the Government to rolling out ICT sector to all parts of the country hence; improve computer based data management together with communication facilities such as the internet and charging of mobile phones especially in rural areas among other benefits;
- Furthermore, electric lighting will improve security at night and enables extended opportunities for work and study,
- Increased security,

- Access to electricity will in addition improve the general the quality of life and accord business and economic opportunities to unemployed especially Youth, women and men across all parts of the country.
- The proposed transmission line will increase security and reliability of electricity power supply in Kenya and particular in surrounding areas of TL. This will in essence boost various sectors including trade and industry; health; education, business (and especially small scale businesses); water and sanitation; security.

1.5 Environmental and Social Impact Assessment (ESIA) Study

1.5.1 Overview of ESIA Study

The Kenya government enacted the Environmental Management and Coordination Act (EMCA, 1999) and its subsidiary legislations such as Environmental Impact Assessment and Audits Regulations, 2003 and international best practices.

In accordance EMCA, 1999 project listed in the second schedule (Annex 1) such as the proposed project, are required to undertake an environmental impact assessment (ESIA) prior to implementation. Therefore, in order to comply with EMCA 1999, its subsidiary legislations, various national laws and international best practices, the proponent has prepared this ESIA report for the proposed project.

Therefore, the ESIA study was undertaken in strict adherence to various national laws and in compliance with best international practices governing all aspects of social and environmental management and control mechanism Annex 2 of EMCA 1999 lists construction of transmission lines as projects that should be subjected to ESIA studies.

1.5.2. Right-of-way (Way Leaves)

In undertaking the ESIA Study the “Right of Way” principle and best practices requirements were observed.

The right-of-way for a transmission corridor includes the land set aside for the transmission line and associated facilities, and land set aside for a safety margin between the line and nearby structures and vegetation. Having the safety margin helps avoid the risk of fire and other accidents. The right-of-way width needed for transmission lines ranges from 30 metres to 60 metres. The right-of-way is also used for access roads. Vegetation that could pose a danger to a transmission line or tower is removed inside the right-of-way an outside the right-of-way if it could come too close to lines and pylons. On the right-of-way, low-growing vegetation is allowed to grow after construction and subsequently maintained at an optimum level.

1.5.3. Objectives of the ESIA

- To undertake an environmental and social impact assessment (ESIA) for the proposed project
- To ensure the proposed project’s compliance with the EMCA Act of 1999 and its Regulations based on Environmental Impact Assessment and Audit guidelines of 2003
- To understand anticipated environmental impacts from the proposed project and suggest appropriate mitigation measures
- To guide in making decision for sustainable management in respect to the proposed project
- To develop an environmental management and monitoring plan for the proposed project.

1.5.4. ESIA Study Methodology

The general approach and methodology for addressing all identified issues of the ESIA study were guided by the scope of work, objectives and expected outputs indicated in the Terms of Reference (ToR). The ESIA approach and methodology employed both quantitative and qualitative approach in collection of data and analysis structured within the framework of existing policy and legal aspects and components of environmental, ecological, social and biodiversity requirements of the ESIA study. In particular, the ESIA methodology underpinned upon the relevant Clauses of the EMCA 1999, the EIA Regulations (2003) as stipulated under the Gazette Notice No. 56 of 13th June 2003, and other national and international legislative and policy safeguards applicable in assignments of this nature and magnitude. Specific study techniques and approaches employed included: consultative and participatory approach; document review; baseline screening, environmental scoping; key stakeholder interviews, public participation, analysis of social and environmental issues and impacts including elucidation of the environmental management plan, and compilation of the ESIA report.

Consultative and participatory approach

A team of environmental impact assessment experts from ANECT, held several brainstorming exercise with representatives of the proponent to understand the project background, preliminary designs and the implementation plan as well as commissioning. The ESIA study team maintained these consultative discussions with the Proponent throughout the period of the study to obtain technical and logistical guidance as necessary. Other specific consultations and discussions as the study progressed and reports submitted concerned aspects of: scope of the study; study methodology; identification of Impacts; and mitigation measures.

Document review

Desktop study involved identifying and gathering relevant documents from the proponent and reviewing the same to enhance knowledge and information on all the aspects of the study necessary for enriching the ESIA study findings and recommendations including the way forward for sustainable management and monitoring of the identified environmental and social impacts.

The literature included a review of previous studies on the proposed project such as feasibility studies and project appraisal including other details used to determine specific infrastructure development activities. In addition, the review of the existing policies, Legal and Regulatory Framework including The Environmental Management and Co-ordination Act 1999 (which is the key legislation document that governs EIA studies in Kenya) Second Schedule of EMCA 1999, were extensively undertaken. Annotated references and bibliography were applied in the reports as the source of information used for the study.

Biophysical and social screening

The methodology for biophysical scoping involved data collection, collation and presentation of the baseline information on the environmental characteristics of the existing situation. Physical environment addressed topography, landforms, geology, soils, climate and meteorology, and hydrology while biological environment included vegetation/habitat types and structure, flora and fauna types and diversity, endangered species, sensitive habitats among others. Social and cultural environment focused on population, land use, planned development activities, community structure, employment and labour market, sources and distribution of income including cultural properties.

Environmental scoping

The environmental scoping or baseline information phase of the ESIA study, focused on observation, physical investigation and verification of survey/GIS data of the entire transmission line. The essence of the scoping exercise that was undertaken as an initial major milestone for the

ESIA and it ensured all the main issues of the study focus were identified and addressed adequately, targeting also indirect and secondary effects arising from the proposed project.

Habitat structure and species diversity

The sampling design and data collection was based on national, regional and international guidelines. Prior to the field data collection the length of transmission line was divided into **7 sections** based on rough similarity in agro-ecological zone, land use, vegetation, and topography. Further stratification within each section was used to place sampling points to capture refined variation and identify ecologically sensitive areas. The sections were; Embakasi-Kithamani; Matuu area; Kitui area; Tana River County dry zone; Tana River ecosystem; Masalani-Ijara and Lamu area. The data captured the habitat types, vertical stratification, density, cover, dominance, species composition and diversity.

Key stakeholders interviews

A semi structured questionnaire was used to guide interviews and discussions with key stakeholders. Some of the key informants interviewed included staff from the following institutions and organizations: County departments (such as Land Officers, Water and Sanitation, Planning, Environment, Gender and Youth representatives, KWS, KFS, NMK and KEFRI), NGOs, CBOs and Faith based Organizations.

Plate 1 below, shows a Public participation meeting at Masarani in Ijara Sub-county of Garisa County



Public participation

Public meetings were the principle method used to conduct public consultations. Twelve public participation meetings were conducted in various locations within counties traversed by the transmission line. The focal point for public participation were drawn from: ordinary members of the public represented by the community leaders, local administration represented by the Chiefs, line ministry represented by departmental heads for national and county governments. Views of the public were also sought through sending of questionnaires to relevant entities. The questionnaire was sent together with a project description for contextualisation.



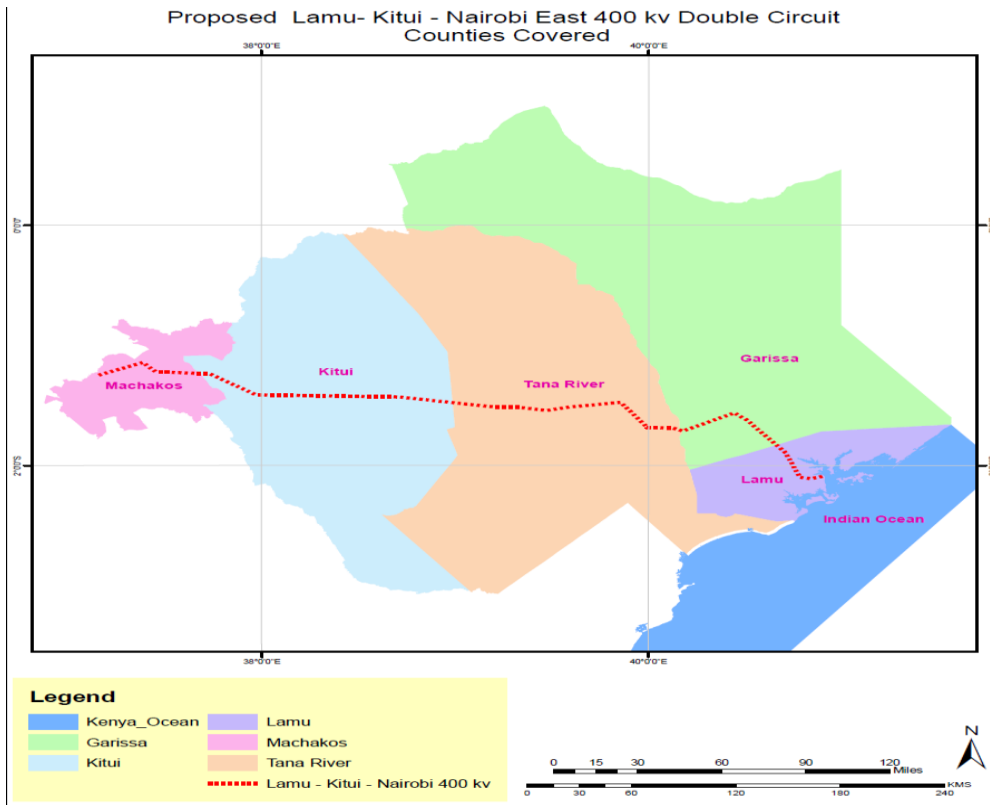
Plate 2 above: Public participation meeting under a mangrove tree Bargon Location in Lama County .

2.0 PROJECT DESCRIPTION

The Government is in the process of building a coal electricity generating plant in Lamu County. The giant plant will have a capacity to generate more than half of the country's current electricity consumption. The Lamu power plant will initially use imported coal, and later convert to use of locally developed coal from Mui Basin, Kitui County. As part of implementing the project, the proponent has therefore designed the Lamu-Nairobi East 400 KV double circuit transmission line to tap into the national grid the electricity generated at Lamu coal plant- a distance of 520 KM.

As shown in map 1 below, L-NE OHTL traverses five Counties of Lamu, Tana River, Garisa, Kitui and Machakos covering a distance of 520 Kilometers.

Maps 1 below: Geographical Countries through which the L-NE OHL traverses



2.1 Nature of the Project

The project essentially involves construction of an approximately 520km, 400 Kv Double Circuit overhead power transmission line from the proposed coal electricity generating plant in Lamu to terminate at a substation located in Nairobi East, near Koma Rock in Matungulu Sub-County in Machakos County.

In general, an overhead power line (OHL) is an electric power transmission line suspended by (pylons) towers or utility poles. Since most of the insulation is provided by air, overhead power lines are generally the lowest-cost method of transmission for large quantities of electric energy. An OHL will basically comprise of the structure, conductors, insulators, and ground conductors. OHL sometimes have spherical markers "of one color" to meet International Civil Aviation Organization recommendations.

The structure suspends the conductors in the air and could be a simple pole for lower voltage transmission or steel lattice pylons for high voltage transmission. The proposed OHL will be a high voltage transmission line with steel lattice pylons. The conductors (wires) for high voltage

transmission are made Aluminium reinforced with steel. Conductors made of Aluminium are cheaper and half as heavy when compared to conductors made of copper. Insulators support the conductors either above the structure or below the structure and must withstand both the normal operating voltage and surges due to switching and lightning. Insulators are mostly made up of porcelain, toughened glass, or plastic polymers. Overhead power lines are often equipped with a ground conductor (shield wire or overhead earth wire). A ground conductor is a conductor that is usually grounded (earthed) at the top of the supporting structure to minimize the likelihood of direct lightning strikes to the conductors. Very high-voltage transmission lines may have two ground conductors.

2.2. Geographical Location

As shown in map 2 below, the 520 Kilometers long L-NE OHTL traverses five Counties of Lamu, Tana River, Garisa, Kitui and Machakos respectively.



Maps 2 above: Geographical Countries through which the L-NE OHL traverses

2.3 Project Design

The design criteria as adopted for the conceptual design are initially based on KETRACO’s current practice, based on studies of recently composed specifications and in-situ inspections of existing transmission lines. Main criteria when concluding on the adopted conceptual design has been to ensure that the various line and substation components are designed in a safe, cost effective and reliable manner. A brief description of the project’s material inputs will include:

Conductors

The conductors recommended for the various sub-project options are Aluminium Conductor steel Reinforced (ACSR) “Wolf” and “Lynx” conductors which are according to KETRACO’S and Ministry of Energy’s standards. The operational performance of the selected conductors, both mechanically

and electrically has proven satisfactory under Kenyan conditions. If the detailed line survey for particular sections result in limitations of right of way (ROW) resulting in a compact line design, lighter All Aluminium Alloy Conductors (AAAC) will be considered to minimize tower sizing.

Overhead earth wire (OPGW)

According to KETRACO's standards, a single overhead shield wire is recommended for 400kV lines. The wire would provide a 25 degrees shielding angle for the line circuit which is considered satisfactory considering the isokeraunic level in the region ranging from 120 to 180 thunderstorms days per year.

Supporting structures

Lattice steel self-supporting structures are recommended for the project.

Conductor configuration

KETRACO's current practice is to use a triangle conductor configuration on single circuit lines with the two lower phases on the same horizontal plane. The configuration results in slightly lower and lighter tower with a modest cost saving compared to the typical triangular configuration with the three phases in a horizontal configuration. A double circuit configuration requires the use of the phase conductors for each circuit in a vertical plane.

Foundations

Based on the observation of the ground conditions during the line route surveys, conventional pad and chimney foundations and reinforced concrete pad and chimney foundations are recommended by the design engineer. On certain sections where poor soils or submerged conditions are identified, a raft type design will be required. Hard rock foundations are not foreseen but weathered rock exists which might require heavy excavation equipment and supply of imported backfill for the pad and chimney foundations.

Grounding

All towers will be permanently grounded with an individual tower footing resistance aimed to be less than 200ohms. Over the first 1.5Km or 3 to 4 spans out of any substation, all towers including the terminal towers would be connected together by continuous counterpoise cable which also should be connected to the substation. At tower sites in urban areas often frequented by people, protective earthing would be carried out aimed at less than 10ohms.

Insulator strings

Composite silicone/polymer long rod insulators are to be used in the insulator strings for the support of the line conductors. Besides being competitive in price, their low weight and compact configuration result in lower transport, installation and maintenance costs. The Electromechanical ratings of the insulators to be installed are U70 and U120 according to IEC standards.

Circuit breakers

The operation of circuit breakers causes switching surges that can result in interruption of inductive current, energization of lines with trapped charges, and single phase to ground fault. Modern circuit breakers, operating in two steps, reducing switching surges to 1.5-2 times the 50HZ voltage.

Lightning Arrestors

Lightning strikes produce high voltages and travelling waves on transmission lines causing insulator flashover and interruption of operation. Steel grounded shield conductors at the top of the towers significantly reduce, but do not eliminate the probability of direct lightning strikes to phase conductors. Lightning arrestors are designed to improve the voltage withstand of substation

equipment and are normally installed as the first equipment before the line terminates at the substation gantry and before such equipment like transformers, reactors.

Dampers

The conductors are protected by dampers which prevent the vibrations from reaching the conductors at the clamps or supports. There are three types of vibrations: simple swing, low frequency vibration and high frequency oscillations.

2.4 Project Activities

The proposed projects' activities can generally be divided into four stages, namely: preconstruction/project design; construction; operation; and eventual decommissioning of the transmission line.

2.4.1 Pre-construction/Project Design

KETRACO is currently applying for various permits and licenses to facilitate preparations and construction of the project. The procurement of the various goods and services and contracting of the construction firm and other consultants will begin after the completion and approval by NEMA of the ESIA study.

2.4.2 Construction

The construction of the transmissions line will require the creation of some temporary access roads to the construction sites. The construction will require some localized vegetation clearance. Materials arising from ground excavation will either be spread in appropriate areas surrounding the line or removed to another site as agreed. The construction will focus mainly on erection of pylons and suspension of conductors and insulators.

Erection of pylons

Prefabricated knocked down pylon steel pieces (pylon elements) will be delivered to the sites of the pylons using a lorry. The four-hole foundation will be dug manually using excavators, and crow bars, and the base pylon elements embedded in the foundation through well vibrated casting concrete. In areas with hard rocks, use of compressors, drills and blasting will be used to dig the holes. Petrol powered concrete mixers will be used to make the casting contract. Upon foundation elements setting and curing, the other pieces of the pylon will be assembled through bolting and riveting. Strong aluminium rollers will be used to hoist the structures and in exceptional situation helicopters can be used.

Blasting permit and permit to apply explosives will be obtained from the Department of Mines and Geology. On the other hand, a blaster licensed by the Department of Mines and Geology will be employed

Suspending of conductors and insulators

The conductors will be unwound from the reels and hoisted through use of powered winches and rigged looped through the insulators attached to the pylons.

2.4.3. Operation

Once constructed, the transmission line will require minimal maintenance which may entail occasional bush clearing, surveillance to deter vandalism and repair of damaged pylons and conductors. After a period of many years, the entire system would need a detailed survey and overhaul. There may be a requirement for occasional visits to ensure nothing goes wrong. Access rights may need to be retained to allow for maintenance works in the future.

2.4.4 Decommissioning

The transmission line will likely to remain in place for many years and therefore any decommissioning works would be a long time in the future. The transmission line and substation

would be dismantled and removed and materials recycled/re-used as far as possible. Any areas disturbed would be restored to pre-project conditions and/or to conditions acceptable to NEMA. Environmental impacts associated with the decommissioning process would be minimized through the implementation of an environmental management plan (ESMP).

2.5 Project Budget

The estimated cost of the project is approximately Kshs. 315, 374,000 (three hundred and fifteen million three hundred and seventy for thousand) only.

2.6 Target Group for the ESIA Report

The ESIA Report has been prepared for use by different stakeholders who will be involved in various operations at various stages of the project such as: construction, operation, and decommissioning of the proposed project. The report contains useful information on policies and procedures to be adhered to, implementation modalities, analysis of potential environmental and social impacts and suggested mitigation measures at various stages of project activities. The information will be significant for planning, implementation, management and maintenance of the substation.

In this regard, the study report will be significantly applied to guide planning and decision making by among others, the following stakeholders:

- Funding agencies and donors;
- Relevant government ministries and agencies for policy implementation;
- Affected and Interested persons;
- Planners and Engineers to be involved in preparation of designs and plans for the project;
- Contractors to be engaged in the project;
- People to be involved in the management and operation of the project.

2.7 Analysis of Project Alternatives

As indicated in section 1.3. above, KETRACO's mandate includes design, construct, operate and maintain new high voltage transmission infrastructure that will form the backbone of the national transmission grid. Therefore, analysis of the project was done within the context of the mandate of KETRACO and focused on comparison of the project benefits and costs taking into account the following considerations: not undertaking the project (No project); alternative project designs; and project option.

2.7.1 The “Do Nothing” Option

For this project, the no-development option would mean the proposed project will not be implemented. In the short term, this scenario ensures status quo in the bio-physical and socio environment along the project area.

The implications of this would be no additional reliability and security of electricity supply in the country. The country will continue experiencing unstable electricity supply associated with load shedding and outages due to demands exceeding supply. The proposed project is key in realization of one of the objectives of Medium Term Plan 2 of ensuring the country avails at least 5,000 MW of power by 2017. The No Project option will therefore in the medium and long term dent the availability of electricity power, throw into disarray the MTP 2 and derail the progress being made towards realization of vision 2030. These are phenomenal liabilities. Given the nature of the project, and that the level of impacts associated with the project are low and that there is high

probability of mitigation of these negative impacts, the “no-go” option is not the most viable option in this instance.

2.7.2 Demand-side Management Option

Demand Side Management (DSM) is a function carried out by the electricity supply utility aimed at encouraging a reduction in the amount of electricity used at peak times. This is achieved by influencing customer usage to improve efficiency and reduce overall demand. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. One of the basic tools is the price differentiation (such as time-of-use tariffs) between peak demand time and low demand time. This option is practiced to a certain extent, but is currently not considered feasible for managing the level of growth forecast for the country.

2.7.3 Alternative Project Designs

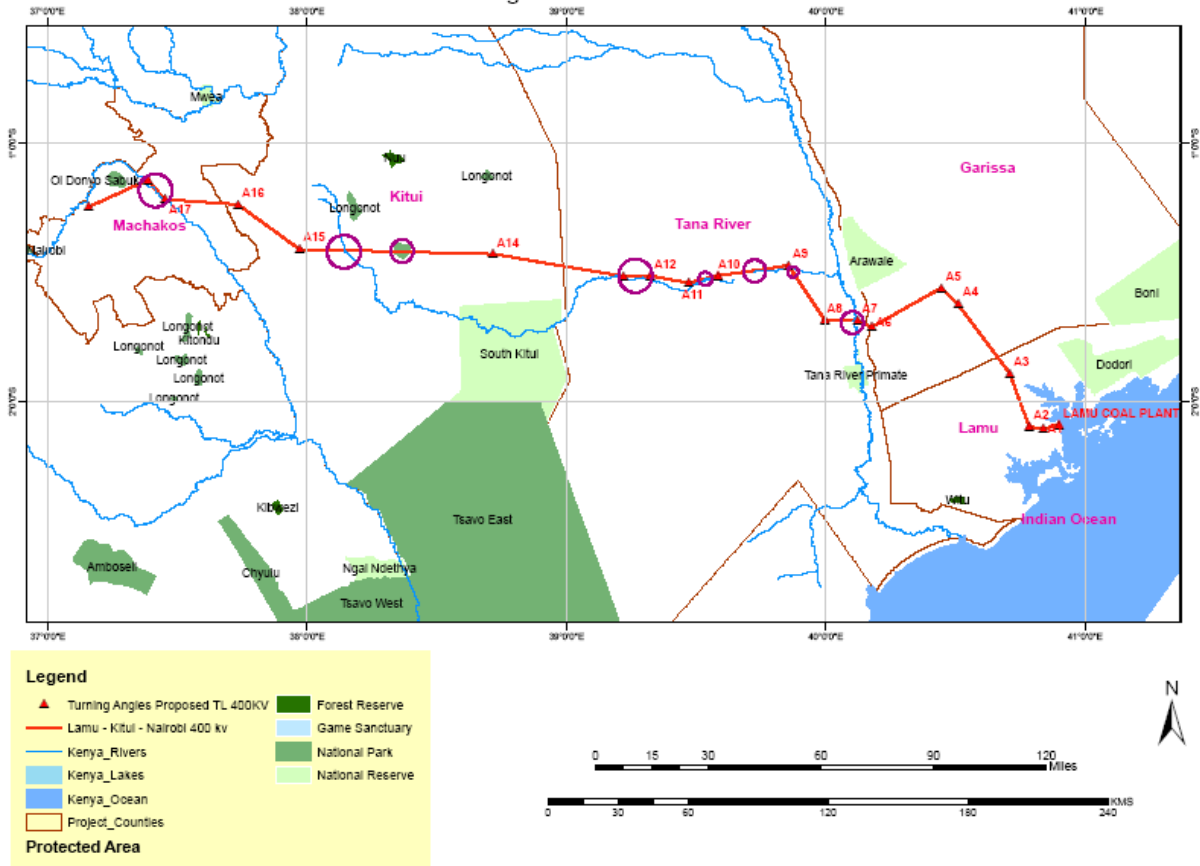
Alternative designs could involve line routing alternatives, use of underground cables and localized electricity generation.

Line routing alternatives

In proposing the above line route, consideration was given to social and environmental impacts of the project. The transmission line will generally follow open ground with minimum settlement to avoid areas of dense settlement and where impacts on environment and local people e.g. from loss of farmland or grazing land are minimal.

The proposed route of the transmission line was done to avoid ecologically sensitive areas such as forests, game reserves and hilltops (map 3 below). The routing was also done in consideration of cost-effectiveness by avoiding as much as possible excessively steep areas such as hills and areas with high population. Therefore, there would be no added benefit of rerouting the route as all important parameters were considered in mapping the current route.

Proposed Lamu- Kitui - Nairobi East 400 kv Double Circuit
Ecological Sensitive Areas



Map 3: L-NE OHTL route vis a vis ecologically sensitive sites

Underground cables

Underground insulated cables can be used rather than the overhead power lines and steel towers. Use of underground cables ensures that the aesthetic pollution associated with pylons is avoided as well as other dangers posed by the pylons such as birds strikes and risks of accident in construction and maintenance of the lines. Underground cables are also less affected by bad weather, vandalism and acts of terrorism. Although underground cables are aesthetically more appealing, construction and maintenance on the lines becomes more complicated. The costs of insulated cable and excavation during construction are much higher than overhead construction. Another more important challenge is that electric faults in underground transmission lines take longer to locate and to repair. A number of countries such as the US, Canada and Newzealand have experienced serious problems with electricity supply from use of high transmission underground lines which took weeks to correct due to challenges in locating the source of the problem. Other grid maintenance activities such as complex switching and interconnectivity of grids (across countries) are easier to undertake on overhead lines rather than underground ones. At present level of technology, and given the length of the proposed transmission line, and the load to be carried, the cost benefit analysis favours use of overhead transmission as proposed in the Project option.

Localized generation of electricity

Another consideration in avoiding an overhead transmission lines running over a long area would be to have a safe, scalable, efficient, cheap, power generation source placed near the consumers. This is attractive to address small demands but the number of such units to replace the proposed overhead transmission lines would be impossible to manage and hence not feasible.

2.7.4 The Project Option

Analysis of alternatives shows that the Project option is justified in terms of cost-effectiveness. As the coal plant for power generation is in Lamu, building of an overhead transmission lines will be

necessary to avail the power to other areas of the country. The power transmitted will contribute to achievement of MTP 2 objectives of availing at least 5,000 megawatts of power in the medium term and vision 2030 objectives in the long term. The technical requirements for building the line to mitigate negative impacts associated with such overhead lines has been adequately integrated in the project design. The environmental impact assessment has also in the environmental and social management and monitoring plan has outlined all mitigations measure that the proponent will have to put in place to ensure that the project is implemented with minimum environmental and social costs.

3.0 APPLICABLE INSTITUTIONAL, POLICY AND LEGAL FRAMEWORK

3.1 Institutional Frameworks

For successful implementation of all aspects of the project, various key institutions and institutional frameworks have been taken into consideration to strengthen environmental and social policies that are necessary for sustainability of the project.

The institutions relevant to the project have been broadly grouped into two categories, namely, those institutions within the electricity sub-sector and those which are outside the electricity sector respectively:

3.1.1 Institutions within electricity sector

The electricity subsector is comprised of policy formulators, regulators, power generators, power transmitters and distributors and consumers (Figure 1 below)

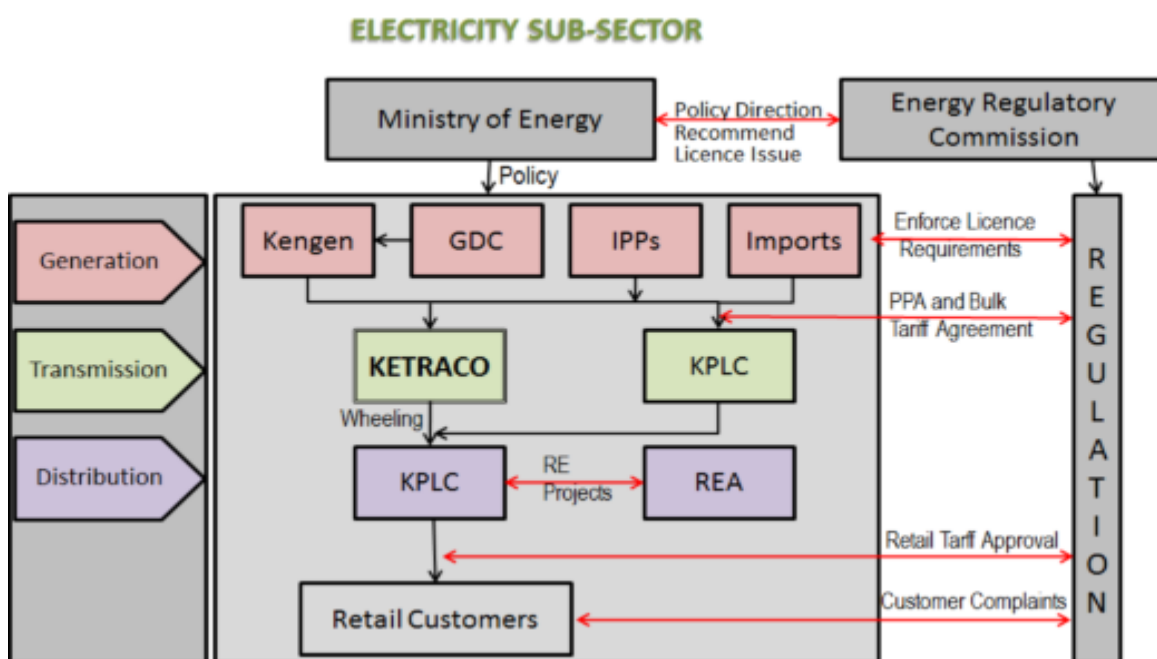


Figure 1: Institutional arrangement within the electricity sector

Ministry of Energy (MoE) – is mandated by both the Policy and the Law for the stewardship of the sector through energy policy development and review. The Ministry makes and articulates energy policies to create an enabling environment for efficient operation and growth of the sector, prepares a least cost development program for the power sector and facilitates mobilisation of resources for the energy sector. The MOE is responsible for the formulation and articulation of overall power. Furthermore, among other functions, the Ministry is also responsible for the expansion and of the upgrading of energy infrastructure, increasing the accessibility to power and electricity to all segments of the population for example through administering the Rural Electrification Scheme; ensuring security of supply in power through diversification of sources in a cost effective manner; and enhancing the legal regulatory and institutional frameworks to create consumer. The proposed project will greatly contribute to realization of the Ministry’s policy objectives.

Energy Regulatory Commission (ERC) –. The ERC was established in 2007 under the Energy Act 2006 as a “single sector regulatory agency, with the responsibility for economic and technical regulation of the electric power, renewable energy and petroleum sub-sectors”. One of the specific

functions of ERC's is regulation of importation, exportation, generation, transmission, distribution, supply and use of electricity energy. The proposed project will therefore abide to any regulatory decision that the ERC might impose. The proposed project will also contribute to realization of ERC function as it has a role of preparing an indicative national energy plan

Kenya Electricity Generating Company (KenGen) - KenGen generates electricity from various sources which include hydro, wind, thermal and geothermal. Its establishment has been based on the enactment of the Electric Power Act 1997, which separated generation from transmission and distribution. The infrastructure to be developed by the proposed project will assist KenGen in transporting electricity generated at Lamu coal plant.

KETRACO - is a wholly state owned company, which is responsible for the development of the national transmission grid network and for the facilitation of regional power trade through its transmission network. One of the guiding principles in the operations of the company is "customer focus: As no capital related expenses are passed on to the consumer, KETRACO contributes to the Government agenda of making power affordable to the consumers. The proposed project will therefore contribute to improvement of power quality, supply and affordability"

The Kenya Power and Lighting Company (KPLC) - is involved in transmission and distribution systems comprising 220kV, 132kV and 66kV (transmission lines that existed before the coming into play of KETRACO). KPLC also supply electrical energy to end-users. The company has rebranded as Kenya Power in 2011. The proposed project will be vital to KPLC as it will avail electricity energy for KPLC to retail.

Rural Electrification Authority (REA)- Rural Electrification Authority which came into operation in July 2007 implements the Rural Electrification Programme. The Rural Electrification Authority (REA) was established under section 66 of the Energy Act as a body with the principal mandate of extending electricity supply to rural areas, managing the rural electrification fund, mobilizing resources for rural electrification and promoting the development and use of renewable energy. The proposed project will be vital to REA as it will avail electricity energy for rural electrification.

Independent Power Producers (IPPs) - The IPPs help in alleviating shortages in electricity generation and distribution in the county and encourage healthy competition in the sub-sector. The coal plant in Lamu will be operated by an IPP and proposed OHTL will be vital in evacuation of generated electricity to the country's electricity consumers.

Consumers. The consumer (institutions and individuals) are the ultimate beneficiary of the proposed project through improvement of power quality, supply and affordability.

3.1.2 Institutions outside Electricity Sector

National Environment Management Authority (NEMA)

The objective and purpose for which NEMA is established is to exercise general supervision and coordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. NEMA's mandate is designated to the following committees as follows;

County Environment Committees

According to EMCA, 1999 No. 8, the Minister by notice in the gazette appoints County Environment Committees which are responsible for the proper management of the environment within the counties. They are also to perform such additional functions as are prescribed by the Act or as May, from time to time be assigned by the Minister by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them. The proponent will furnish the County Director of Environment in the following Counties through which the TL

traverses: Machakos, Kitui, Garissa, Tana River and Lamu with details of the proposed project as information available to County Environmental Committees.

Public Complaints Committee

The Committee performs the following functions;

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Council.
- Prepare and submit to the Council periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To perform such other functions and exercise such powers as may be assigned to it by the Council.

The proponent will be ready to cooperate with the Public Complaints Committee in issues that might arise due to the proposed project.

Standards and Enforcement Review Committee

This is a technical committee responsible for environmental standards formulation methods of analysis, inspection, monitoring and technical advice on necessary mitigation measures. The proponent will be ready to take any action that might be required by the Committee in relation to proposed project.

Kenya Forest Service

Kenya Forest Service has the responsibility of management of all public forests. The proposed transmission line will transverse forests under the jurisdiction of Kenya Forest Service namely Mboni Forest in Lamu County. The proponent will observe laid out procedures for obtaining easement to transverse Mboni Forest. As required, the project will also compensate KFS as might be necessary for any trees to be cut, and obtain way-leave as applicable.

Kenya Wildlife Service

Kenya Wildlife Service has the responsibility of management of National Parks, Game Reserves and Natural resources within the Wildlife Gazetted areas of the country. The proposed transmission line will not transverse any of the above designated areas under the KWS management. However, the proponent will liaise with KWS institution when necessary and also observe laid out procedures for obtaining easement to transverse as need be. As required, the project will seek way leave to transverse areas under jurisdiction of KWS as necessary.

Commissioner of Mines and Geology

The Commissioner of Mines and Geology among other functions issues permits for use of explosives for blasting of rocks. As sections of the OHTL will be constructed in areas that will require blasting of rocks to erect electricity pylons, the proponent will in such cases obtain necessary authority to blast the rocks.

Kenya Civil Aviation Authority

The proponent will furnish the Kenya Civil Aviation Authority with information on proposed project to enable the authority update its information on aviation security and safety. This will also ensure the proposed transmission line is at least 2.5 Kms from any airstrip or airport as required by KCCA.

3.2. Policy Frameworks

The proposed Lamu-Nairobi East 400 KV double circuit transmission line project will be guided by several policy framework such as Vision 2030 and its Medium Term Plans, and the Energy Policy.

3.2.1 Vision 2030

Kenya Vision 2030 is the new long-term development blueprint for the country. It is motivated by a collective aspiration for a better society by the year 2030. The aim of *Kenya Vision 2030* is to create “a globally competitive and prosperous country with a high quality of life by 2030”. It aims to transform Kenya into “a newly-industrialising, middle-income country providing a high quality of life to all its citizens in a clean and secure environment”. The vision for the environmental sector is “a nation living in a clean, secure and sustainable environment”. The vision is inspired by the principle of sustainable development and by the need for equity in access to the benefits of a clean environment

The envisaged growth under *Kenya Vision 2030* will be dependent on agriculture, tourism, manufacturing and the energy sector, which heavily rely on exploitation of natural resources and the environment. All the expected changes to spur economic development will exert immense pressure on the already declining natural resources base and on the country’s fragile environment. This necessitates a strong policy on the environment in order to sustain economic growth while mitigating the impacts of rapid industrialization. The objectives of the Vision have been adopted as GoK’s national development objectives.

The overall national development objectives of the Government of Kenya are accelerated economic growth; increasing productivity of all sectors; equitable distribution of national income; poverty alleviation through improved access to basic needs; enhanced agricultural production; industrialisation; accelerated employment creation and improved rural-urban balance. The extent, to which these objectives can be realised on a sustainable basis and environmentally sound manner, is dependent on the degree and economic efficiency with which critical factors of production are made available and combined with each other to produce the desired results. The realisation of these objectives is only feasible if quality energy services are availed in a sustainable, competitive, cost effective and affordable manner to all sectors of the economy ranging from manufacturing, services, mining, and agriculture to households. The proposed project will contribute significantly to achievements of vision 2030.

3.2.2 The Medium Term Plan 2 (2013 – 2017)

The Medium Term Plan 2 (MTP 2) strategy in regard to energy is modernizing energy infrastructure network, increasing the share of energy generated from renewable energy sources, and providing energy that is affordable and reliable to businesses and homes. This will ensure that our energy supply is adequate and efficient in order to support increased use in manufacturing, agriculture, services, public facilities and households. The Plan aims at increasing installed capacity for electricity generation by 5,538 MW in 2017. The government will also increase access to electricity through upgrading and expansion of the national power transmission and distribution network to improve supply and reliability, reduce losses and connect two million new customers by 2017. Rural Electrification Authority (REA) will continue implementing Rural Electrification Programme countrywide and targets to connect 6,304 public facilities. These will include electrifying the remaining 2,600 main public facilities (trading centres, secondary schools, health centres and dispensaries) and other public facilities including primary schools, tea buying centres, water supply systems, and places of worship among others. The coal plant to be built in Lamu is part of operationalization efforts of the MTP 2 aspirations and the proposed project will key in evacuating electricity general hence helping in meeting the targets of MTP 2

3.2.3 Draft Energy policy 2014

The overall objective of the energy policy is to ensure affordable, competitive, sustainable and reliable supply of energy to meet national and county development needs at least cost, while protecting and conserving the environment. In particular and relevant to propose project, the policy recognizes coal as an affordable, competitive, reliable and easily accessible source of energy,

especially for electricity generation. The policy sets to exploit coal to provide 1,900MW of electricity generation by 2016 and 4,500MW by 2030. The Energy Policy Support the development by KETRACO of new transmission lines, comprising of about 5,000 km in the short term and 16,000 km by 2031 to enhance security, reliability and affordability of electricity supply. The proposed project is one of the premier activities that seek to operationalize the policy statements in the Energy Policy 2014...

3.3. Legal Frameworks

The legal frameworks relevant to the proposed project in its planning, operation and decommissioning have been analyzed and outlined in Table 3 below for addressing by proponent in implementation of the project.

Table 3. Legal frameworks that the project will be subjected to and how KETRACO will comply

Legal Framework	Requirements of the legal framework	KETRACOS commitments
Constitution of Kenya	Under Chapter 5 (Land and environments) in Part 2 (Environment and natural resources). Section 42 gives every person a right to a clean and healthy environment, which includes the right; and to have the environment protected for the benefit of present and future generations	<ul style="list-style-type: none"> • To be guided by this principle while undertaking proposed project
The Energy Act, No. 12 Of 2006	<p>The Act gives Electricity Regulatory Commission (ERC) the role to:</p> <ul style="list-style-type: none"> • Process and recommend applications for licenses for generation, distribution and transmission • Set, review and adjust transmission and distribution tariffs. • To enforce environmental and safety regulations, investigating complaints and <p>The Energy Act, 2006 also provides for</p> <ul style="list-style-type: none"> • The way an electricity supply licensee is permitted to enter land for purposes of constructing electric lines. It highlights the process of establishing way-leaves and compensation for way-leaves, compulsory acquisition of land for way-leaves purposes. The act prescribes the manner with which licenses shall be obtained for generating, transmitting and distributing electricity. It clearly exempts private users from these licensing requirements for any power less than 1MW generated at the user's premises. However, a license is required if: One is generating more than 1MW or, the power requires a transmission system from the generation site to the consumption site or the power will be distributed to others (members of the public). The act also requires that all accidents and fatalities at 	<ul style="list-style-type: none"> • Seek all necessary licenses from ERC for transmission • Pay required tariffs • Respect and abide with any requirements on safety • Respect all requirements for constructing lines, getting wayleaves and compensation

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	energy facilities be reported officially to the commission.	
Environmental Management And Coordination Act, 1999	<ul style="list-style-type: none"> • Section 3 of the Act highlights the General Principles that guide its implementation. Every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance it. Section 58. any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carried out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form, giving the prescribed information and which shall be accompanied by the prescribed fee. The proponent of a project shall undertake or cause to be undertaken at his own expense and environmental impact assessment study and prepare a report thereof. <p>Note: Electrical infrastructure including electrical transmission lines project is listed in second schedule</p>	<ul style="list-style-type: none"> • Ensure that the environment is not negatively impacted by the proposed project and prepare an EIA report
EMCA (Environmental Impact Assessment And Audits Regulations, 2003)	<ul style="list-style-type: none"> • Conduct environmental impact assessment • Use NEMA approved experts in undertaking the assessment. • Carry out self-audits 	<ul style="list-style-type: none"> • Carry out EIA and obliged to requirements provided by the EIA and audits regulations, 2003 sections 12 (I) 13 (I) 16, 17, 18, 19, 26, 37 • Carry out periodic self-audits as required by the regulations and the environmental management plan
EMCA (Noise And Excessive Vibration Pollution) Regulations, 2010	<p>Prohibitions</p> <ul style="list-style-type: none"> • make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; • cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source; • Continue or cause to be made or continued 	<ul style="list-style-type: none"> • Comply with stipulations that NEMA may prescribe • Provide PPEs as necessary • Seek license from NEMA if it is inevitable to produce excessive noise and vibrations beyond

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<p>any noise in excess of the noise levels set in the First Schedule to these Regulations, unless such noise is reasonably necessary to the preservation of life, health, safety or property.</p> <ul style="list-style-type: none"> • Operate a motor vehicle which produces any loud and unusual sound; and exceeds 84 dB (A) when accelerating. • Sound the horn or other warning device of a vehicle except when necessary to prevent an accident or an incident. • Operate construction equipment (including but not limited to any pile driver, steam shovel, pneumatic hammer, derrick or steam or electric hoist) or perform any outside construction or repair work so as to emit noise in excess of the permissible levels as set out in the Second Schedule to these Regulations. 	<p>permissible levels</p>
<p>EMCA (Water Quality) Regulation, 2006</p>	<p>Prohibitions</p> <ul style="list-style-type: none"> • Every person shall refrain from any act which directly or indirectly causes, or may cause immediate or subsequent water pollution, and it shall be immaterial whether or not the water resource was polluted before the enactment of the Act. • No person shall throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit such substance in or near it, as to cause pollution. • abstract ground water or carry out any activity near any lakes, rivers, streams, springs and wells that is likely to have any adverse impact on the quantity and quality of the water, without an Environmental Impact Assessment license issued in • cultivate or undertake any development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the Authority from time to • No person shall discharge or apply any poison, toxic, noxious or obstructing matter, radioactive waste or other pollutants or permit any person to dump or discharge such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter, radioactive waste or pollutant complies with the standards set out in the Third Schedule of these Regulations. 	<ul style="list-style-type: none"> • Sensitize construction staff and abide by all requirements

Legal Framework	Requirements of the legal framework	KETRACOS commitments
Emca (Waste Regulations)	<p>Requirements and prohibitions</p> <ul style="list-style-type: none"> • No person shall dispose of any waste on a public highway, street, road, recreational area or in any public place except in a designated waste receptacle. • Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed off such waste in the manner provided for under these Regulations • Any person whose activities generates waste has an obligation to ensure that such waste is transferred to a person who is licensed to transport and dispose off such waste in a designated waste disposal facility. • Any person, whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority. • Any person who owns or controls a facility or premises which generates waste shall minimize the waste generated by adopting cleaner production principles: 	<ul style="list-style-type: none"> • Sensitise construction staff to oblige. • Provide segregation facilities
Physical Planning Act Of 1996	offence to emit smoke, fumes or dust which may be a source of danger, discomfort or annoyance.	<ul style="list-style-type: none"> •
The Public Health Act (Cap. 242)	Part IX section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health. Such nuisance or conditions are defined under section 118 and include nuisances caused by accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin. Section 126A that requires local authorities to develop by laws for controlling and regulating among others private sewers, communication between drains, power lines , and sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc. for reception or disposal of foul matter.	<ul style="list-style-type: none"> • The Proponent shall observe policy and regulatory requirements and implement measures to safeguard public health and safety. •
The Occupation Safety And Health Act (Osha), 2007	The safety, health and welfare at work of all persons working in workplace must be ensured through	<ul style="list-style-type: none"> • Full compliance • OSHA Action Plan shall be developed

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<ul style="list-style-type: none"> • provision and maintenance of plant and systems and procedures of work that are safe and without risks to health; • arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances; • the provision of such information, instruction, training and supervision as is necessary to ensure the safety and health at work of every person employed • the maintenance of any workplace under the occupier's control, in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks to health; • the provision and maintenance of a working environment for every person employed that is, safe, without risks to health, and adequate as regards facilities and arrangements for the employees welfare at work; • informing all persons employed of— <ul style="list-style-type: none"> (i) any risks from new technologies; and (ii) imminent danger; and • Ensuring that every person employed participates in the application and review of safety and health measures. • carry out appropriate risk assessments in relation to the safety and health of persons employed and, on the basis of these results, adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools and process under the control of the occupier are safe and without risk to health and comply with the requirements of safety and health provisions in this Act • send a copy of a report of risk assessment carried out to the area occupational safety and health officer; • take immediate steps to stop any operation or activity where there is an imminent and serious danger to safety and health and to evacuate all persons employed as appropriate. • Register a workplace unless such workplace is exempted from registration under this Act. <p>The following are applicable prohibitions</p> <ul style="list-style-type: none"> • not dismiss an employee, injure the employee 	<p>and shall provide a clear statement of intent and a plan of action for the prevention of accidents and occupational illnesses and injuries</p>

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<p>or discriminate against or disadvantage an employee in respect of the employee's employment, or alter the employee's position to the detriment of the employee by reason only that the employee —</p> <ul style="list-style-type: none"> (a) makes a complaint about a matter which the employee considers is not safe or is a risk to his health; (b) is a member of a safety and health committee established pursuant to this Act; or (C) Exercises any of his functions as a member of the safety and health committee. <p>.Other obligations of the employer</p> <ul style="list-style-type: none"> • shall notify the area occupational safety and health officer of any accident, dangerous occurrence, or occupational poisoning which has occurred at the workplace • Where an accident in a workplace, causes the death of a person therein, the employer or self-employed person shall— <ul style="list-style-type: none"> (a) inform the area occupational safety and health officer within twenty-four hours of the occurrence of the accident; and (b) Send a written notice of the accident in the prescribed form to the area occupational safety and health officer within seven days of the occurrence of the accident. • Where an accident in a workplace causes non-fatal injuries to a person therein, the employer shall send to the area occupational safety and health officer, a written notice of the accident in the prescribed form within seven days of the occurrence of the accident. • An employer shall cause all workplace injuries to be entered in the general register • Where a person injured in an accident dies after the accident is notified under this section, the employer shall send a notice of the death in writing, to the area occupational safety and health officer as soon as he is informed of the death • Where an accident to which this section applies occurs to an employee and the occupier of the workplace is not the employer of the person injured or killed, the employer of that employee, shall, immediately report the accident to the occupier or, the Director 	

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<p>and the area occupational safety and health officer</p> <ul style="list-style-type: none"> • Sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation for persons of each sex • All plant, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, shall only be used for work which they are designed for and be operated by a competent person. • Every employer shall— <ul style="list-style-type: none"> (a) be responsible for the safe condition of tools and equipment used by his employees, including tools and equipment which may be furnished by the employees; (b) ensure that no equipment or portable power tools shall be used in an environment that contains or is likely to contain flammable vapours or substances unless they are intrinsically safe for such environments. • All power driven portable and hand held tools shall have their operating controls so located as to minimize the possibility of their accidental operation if such an accidental operation would constitute a hazard to the worker or other persons. • no chain, rope or lifting tackle shall be used unless it is of good construction , sound material, adequate strength and free from patent defect; • a table showing the safe working loads of every kind and size of chain, rope or lifting tackle in use, and, in the case of a multiple sling, the safe working load at different angles of the legs, shall be prominently displayed on the premises, so, however, that the provisions of this paragraph shall not apply in relation to any lifting tackle if the safe working load thereof, or in the case of a 	

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<p>multiple sling the safe working load at different angles of the legs, is plainly marked upon it;</p> <ul style="list-style-type: none"> • no chain, rope or lifting tackle shall be used for any load exceeding the safe working load thereof as shown by the table referred to in paragraph (b) or marked upon it; • all chains, ropes and lifting tackle in use shall be thoroughly examined at least once in every period of six months, or at such greater intervals as the Director may in any particular case permit, by a person approved for the purposes of this section by the Director by certificate in writing; • no chain, rope or lifting tackle, except a fibre rope or fibre rope sling, shall be used in any workplace for in that workplace unless it has been tested and thoroughly examined by a person approved by the Director for the purposes of this section, and a certificate of such a test and examination, specifying the safe working load and signed by the person carrying out the test and examination, has been obtained and is kept available for inspection: • Provided that the provisions of this paragraph shall not apply as respects any chain, rope or lifting tackle in respect of which there has been obtained, and is kept available for inspection, a certificate of test and thorough examination issued by the manufacturer of the chain, rope or lifting tackle; • every chain and lifting tackle, except a rope sling, shall, unless of a class or description exempted by the Director by notice published in the Gazette, be annealed at least once in every fourteen months, or, in the case of a chain or sling of half-inch bar or smaller, or chain used in connection with molten metal or molten slag, in every six months, so, however, that a chain and lifting tackle not in regular use need be annealed only when necessary. • Every ladder to be issued in workplace shall be of good construction, sound material adequate strength and suitable for the purpose for which it is used and shall be properly maintained. • No ladder shall be used unless— <ul style="list-style-type: none"> (a) it is securely fixed in a position to 	

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<p>prevent it from slipping or falling, except that when this is impracticable, a person shall be stationed at the base of the ladder to prevent it from slipping or falling;</p> <p>(b) it stands on a firm and level footing except in the case of suspended ladder;</p> <p>(c) it is secured where necessary to prevent undue swaying or sagging;</p> <p>(d) it is equally and properly supported on each stile or side;</p> <p>(e) in the absence of adequate handhold, it extends at least one meter above the place of landing or the highest rung to be reached by the feet of the person using the ladder, or if this is impracticable, to the greatest height; and</p> <p>(f) There is sufficient space at each rung to provide adequate foothold.</p> <ul style="list-style-type: none"> • (3) Subsection (2) shall not apply to any folding stepladder, provided that it has a level and firm footing and is used in the fully open position with any spreaders locked. • No person shall smoke, light or carry matches, lighters or other flame producing articles, or smoking materials, in any place in which explosive, highly flammable or highly combustible substances, are manufactured, used, handled • Every employer shall provide and maintain an adequate supply of wholesome drinking water at suitable points conveniently accessible to all persons employed. • A supply of drinking water which is not laid on shall be contained in suitable vessels, and shall be renewed at least daily, and all practicable steps shall be taken to preserve the water and vessels from contamination, and a drinking water supply whether laid on or not shall, in such cases as an occupational safety and health officer may direct, be clearly indicated as the occupational safety and health officer may require. • Every employer shall provide and maintain for the use of persons employed, adequate and suitable facilities for washing, which shall be conveniently accessible and shall be kept in a clean and orderly condition. • Every employer shall provide and maintain 	

Legal Framework	Requirements of the legal framework	KETRACOS commitments
	<p>for the use of a person employed, adequate and suitable accommodation for clothing not worn during working hours.</p> <ul style="list-style-type: none"> • Every employer shall be provide and maintain so as to be readily accessible, a first-aid box or cupboard of the prescribed standard. • Every employer shall provide and maintain for the use of employees in any workplace where employees are employed in any process involving exposure to wet or to any injurious or offensive substance, adequate, effective and suitable protective clothing and appliances, including, where necessary, suitable gloves, footwear, goggles and head coverings. 	
Work Injury Compensation Benefit Act 2007	Provides for the compensation of employees on work related injuries and diseases contracted in the course of employment and for connected purposes. The act includes compulsory insurance for employees	<ul style="list-style-type: none"> • Full compliance
Land Planning Act Cap 303	Section 9 of the subsidiary legislation (the development and use of land Regulation 1961) requires that before the Local Authority submits plans to the minister for approval, steps should be taken as may be necessary to acquire the consent of owners of the land affected by such plans. Comments and objections made by the landowners should be submitted and mitigated with the intent to reducing conflict of interest with other socio-economic activities	<ul style="list-style-type: none"> • To develop RAP that shall guide land acquisition before development.
Land Control Act Cap 302	This act of parliament controls transactions on agricultural land. The act is supported with the land control regulations and Land Control. This Act is triggered as the proposed power line will cross productive agricultural land.	<ul style="list-style-type: none"> • To develop RAP that shall guide land acquisition before development.
Land Acquisition Act 295	The Act provides for the compulsory or otherwise acquisition of land from private ownership for the benefit of the general public. Section 3 states that when the Minister is satisfied on the need for acquisition, notice will be issued through the Kenya Gazette and copies delivered to all the persons affected. Full compensation for any damage resulting from the entry onto land to do things such as survey upon necessary authorization will be undertaken in accordance with section 5 of the Act. Likewise where land is acquired compulsorily, full compensation shall be paid promptly to all persons affected in accordance to sections 8 and	<ul style="list-style-type: none"> • To develop RAP that shall guide land acquisition before development to mitigate asset loss, and where unavoidable, to provide compensation

Legal Framework	Requirements of the legal framework	KETRACOS commitments
Way Leave Act 292	<p>10</p> <p>Provides for certain undertakings to be constructed e.g. transmission. Section 3 of the Act states that the Government may carry any works through, over or under any land whatsoever, provided it shall not interfere with any existing buildings or structures of an on-going activity.</p>	<ul style="list-style-type: none"> • In accordance with the Act (section 4), notice will be given to community members before carrying out works and it shall provide a full description of the intended works and targeted place for inspection. Any damages caused by the works would then be compensated to the owner as per the section
Public Roads And Roads Of Access Act (Cap. 399)	<p>During commissioning and decommissioning, the proponent will vehicular access to the sites areas will be governed by the Act.</p>	<ul style="list-style-type: none"> • Where roads do not exist, the Proponent shall seek permission from the appropriate authorities and land owners to create such access roads during the construction phase.
The Standards Act, Chapter 496	<p>Any applicable standard in material used in the project will be observed to be in line with the standards approved by Kenya Bureau of Standards (KEBS)</p>	<ul style="list-style-type: none"> • Consultation with KEBS
Forests Act, 2005 The Forests (Participation In Sustainable Forest Management) Rules, 2009	<p>A person who wishes to undertake an activity inside a state forest whose primary purpose is to benefit the public in transportation, communication, energy, water supply, research and education or such other purpose as the Kenya Forest Service may approve, may apply to the Service in writing for a special-use licence</p> <p>The Service shall evaluate an application received under paragraph (1) and may, after completion of any environmental impact assessment required under the law, issue a special-use licence if satisfied that the proposed activity is in the public interest.</p> <p>(3) A special-use licence shall be in Form 3 set out in the Schedule.</p>	<ul style="list-style-type: none"> • Application for a special license and involvement of applicable forest officers in public consultations as part of the EIA process
Wildlife (Conservation And Management) Act 2913	<p>Section 9 allows for issuance of general permits for non-consumptive use of wildlife and infrastructure development</p>	<ul style="list-style-type: none"> • Application of general permits to develop the OHTL in areas under jurisdiction of KWS

Legal Framework	Requirements of the legal framework	KETRACOS commitments
The Trust Land Act Chapter 288	<p>The Act in clause 38 provides that a wayleave licence may be granted to any person empowering him and his servants and agents to enter upon Trust land vested in the council and to lay pipes, make canals, aqueducts, weirs and dams and execute any other works required for the supply and use of water, to set up electric power or telephone lines, cables or aerial ropeways and erect poles and pylons therefor, and to make such excavations as may be necessary for the carrying out of any such purposes, and to maintain any such works as aforesaid:</p> <p>Provided that, where the land concerned is the subject of a mining right under the Mining Act, or of a subsisting lease, the council shall not grant a wayleave licence in respect of such land except with the consent of the lessee or the holder of the mining right, as the case may be; but if any such lessee or holder refuses his consent, the council may apply to the Minister, who may grant consent in his place.</p>	<ul style="list-style-type: none"> • Obtain wayleaves through respective county governments where the OHTL pass over trust lands
The Civil Aviation Act, Cap 394	<p>Under this act, the Kenya Civil Aviation Authority (KCAA) has the mandate to authorize and approve the height of the mast for the purpose of ensuring the safety of flying aircraft over the proposed project area. This is of relevance to the siting and height of overhead transmission line (OHTL) tower heights.</p>	<ul style="list-style-type: none"> • The Proponent shall comply with the provisions of the Act in seeking authorization from Kenya Airports Authority for the installation of the lattice steel self-supporting towers along the transmission line route.

4.0 BASELINE BIOPHYSICAL, SOCIAL AND ECONOMICS CONDITIONS

In this section, the ESIA Study provides documentation of baseline and key issues derived from the social and environmental scoping process focusing on all aspects of the study. The section provides findings on the significant changes expected due to the proposed Project. These would encompass environmental, ecological and social impacts, both positive and negative, as a result of interaction between the proposed project and the environment that are likely to bring about changes in the baseline environmental and social conditions arising from construction and overall management of the impacts. The report consider both biophysical and socio-economic factors that include the impacts on population change and migration; Socio-economic characteristics of the difference target groups along the transmission line; Forms of social organization and co-operation; Physical and social infrastructure; Change in economic activities; Development resources; Vegetation clearance; Mechanical disturbance; Removal of structure /sites; Relocation and resettlement; Effects on flora and fauna; Air quality; Water quality, Water quantity, Improved access; Accident rates; and Visual/aesthetic change.

Table 4. Checklist Baseline Biophysical and Social Conditions of ESIA Study

Biophysical	Social
General Description	Population
Location	Human Settlement
Topography and drainage	Land use and tenure
Climate	Livelihood activities
Rainfall	Agriculture and Livestock production
Temperature and evapo-transpiration	Tourism
Geology and Soils	Wellbeing (poverty, livelihoods)
Biodiversity	Energy supply and Use
Hydrology and surface water	Cultural and Historical Importance
Wetlands	
Environmentally sensitive sites	

4.1. Baseline Biophysical Situation

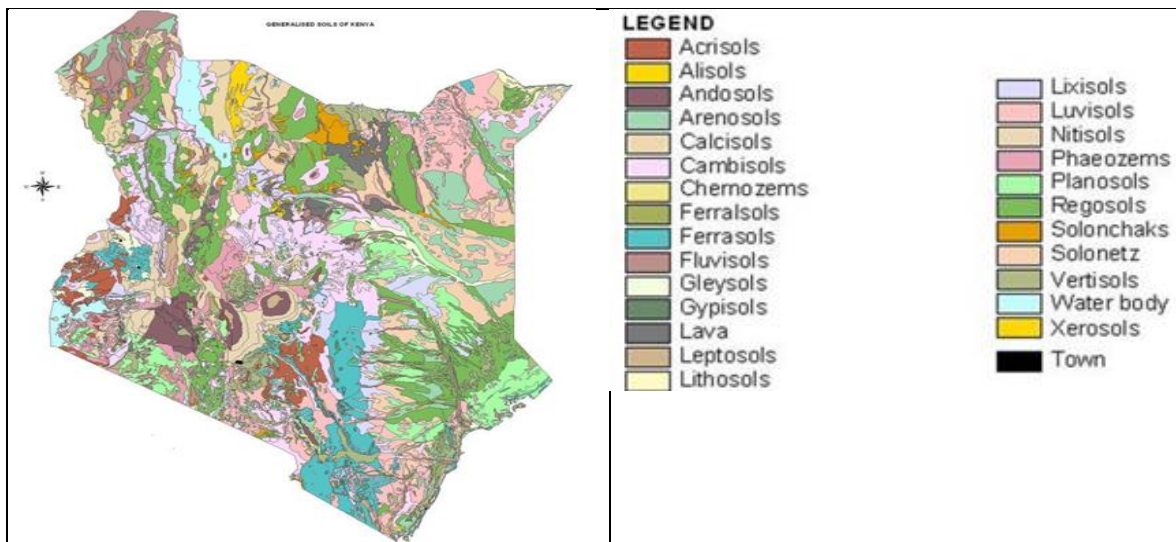
4.1.1 General Description and Findings

The proposed OHTL transverses areas with altitude close to sea level (11 m at Lamu) to areas that have an altitude of about 1800 m at Matungulu, Machakos County. Altitude in the country is closely related to average annual rainfall, which in turn strongly influences the vegetation type especially in savannahs/rangelands. The OHTL therefore cuts across several t vegetation types, rainfall regimes and topography. The objective of the biophysical field study was to answer specific EIA questions on the Transmission Line route and way leave related to; patterns of rainfall; soil types and agro-ecological zones; vegetation types; habitat structure and species diversity; fauna and migration patterns; threatened species and habitats; Protected areas; wetlands; and land use patterns

The EIA study questions are addressed in the sections below

4.1.2 Soils

The variation of soils Kenya is very wide indeed; this is a result of wide variation in the geology, climate regimes, and relief. The study area has a spectacular altitude gradient, accompanied a wide rainfall regime. Soil in the study area vary from sandy to clayey, shallow to very deep and low to high fertility.



Map 4: Generalized map of soils in Kenya. Source: Kenya Soil Survey

Observations of soils during field assessment and reference to the soil map above indicates the key soil types traversed by OTHL are

Table 5: Types of soils traversed by OTHL

Soil type	Characteristics	OHTL section
Vertisols	These soils consist of heavy clay soils with proportion of swelling clays (form deep cracks during the dry season).They also referred to as 'black cotton soils'.	The soil type was found on parts of section A in Embakasi area
Acrisols	This soil group is characterised by very low nutrient levels as indicated by low base saturation. They are reddish-yellow. This group encompasses alfisols and ultisols going the soil taxonomy system.	The soils were identified on parts of Section A and B in Kithimani and Matuu area
Ferrasols	These soils are common in south-eastern semi-arid areas of Kenya. Ferrasols are deep strongly weathered soils formed from old geomorphic surfaces, can be either yellowish (geotite) or reddish (hametite). They are low in nutrients and low pH, but have good physical, are commonly used in shifting agriculture	These were found on parts section B and C in Kitui dryland zone.
Regosols	This soil type was found to cover a very large section of the OHTL. This group lumps several soils that are generally very weakly developed, that those that very shallow (Leptosols), sandy (Arenosols) or with fluvic properties (Fluvisols). The soils	The soil was found in section D (Tana River County dry zone), Section F (Masalani - Ijara). The soil covers large sections adjacent to Tana River on both sides

	are extensive arid and semi-arid arids that are characterised by extensive erosion. In the study area they were observed to have laggas or seasonal waterways and tended to more fluvic towards the Tana River.	
Fluvisols/alluvial soils	These group soils accommodates young soils, principally they lack diagnostic horizons. Commonly they are found as river sediments as was the case here on the Tana River zone.	Observed on the flood zone of Tana River Section E
Planosols	These are soils with bleached, light colored, eluvial surface horizon that show signs of periodic water stagnation. The sub-soil is slowly permeable with high amounts of clay.	These soils were observed mainly in section D, Lamu area where signs of periodic water stagnation were common

The soils with the largest coverage of the OHTL were Planosols, Regosols and Ferrasols.

4.1.3 Agro-Ecological Zones and Rainfall Patterns

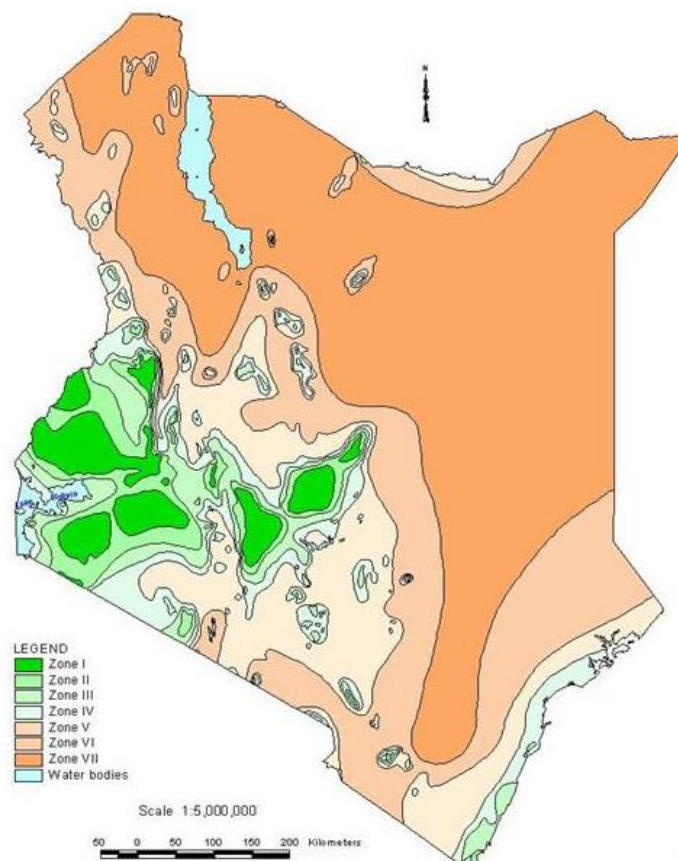
Agro-ecological zones (AEZs) are geographical areas exhibiting similar climatic conditions that determine their ability to support rained agriculture. At a regional scale, AEZs are influenced by latitude, elevation, and temperature, as well as seasonality, and rainfall amounts and distribution during the growing season (FAO 1996). The AEZ can be regarded as a set of core applications, leading to an assessment of land suitability and potential productivity. This is relevant in this study because AEZ zoning can then be used as the basis or proxy methodology for land resource appraisal which is linked to the *land utilization type and land cost*. The AEZ are also closely correlated to human population density distribution

Kenya has a total area of about 582,646 square kilometers of which 11,230 or about 1.9% is covered by water. A simplified agro-ecological that is commonly divides the country into six AEZ described in Table 5 below:

Table 6. Area covered by the Agro-ecological zones of Kenya

Zone	Appr. Area (km ²)	% Total
I. Agro-Alpine	800	0.1
II. High Potential	53,000	9.3
III. Medium Potential	53,000	9.3
IV. Semi-Arid	48,200	8.5
V. Arid	300,000	52.9
VI. Very arid	112,000	19.8
Rest (waters etc.)	15600	2.6

Applying the above system it is apparent 80% of the country lies in the semi-arid to very arid Zones (ASALs), which are predominantly inhabited by the pastoralists and agro-pastoralists. The distribution of the zones is shown map 5 below;



Map 5 above: Agro-ecological zones of Kenya. Source: Kenya Soil Survey

Using the above figure it is apparent the proposed transmission line will pass through 4 agro-ecological zones namely VII, VI, V and IV which range from very arid, arid to semi-arid. Land use patterns, vegetation type, human population density and cost of land are expected with these zones.

The rainfall regimes traversed the OTHL are closely with agro-ecological zones described above. At present there are 700 rainfall stations in Kenya. The OTHL traverses three (3) rainfall regimes. These are 600-800mm at the coastal strip of Lamu, 400-600mm in the Ijara to Masalani area, and 200-400mm in the dry zone Tana River County. The Embakasi area falls and the adjacent Matuu areas fall in the regimes of 600-800mm and 400-600mm respectively.

4.1.4 General Vegetation Types

The vegetation structure and composition in African drylands is governed by two key resources mean annual rainfall and soil nutrients (soil type). It is then strongly modified by the disturbances herbivory and fire. The area traversed by the transmission line shows variation in rainfall regimes, soil types and herbivory pressure from livestock. The natural or “climax” vegetation composition and structure hence zonation is closely related to agro-climatic zones as shown below in Table 7:

Table 7: Vegetation type as related to agro-climatic zones

Zone	“Climax” vegetation and land-use
i). Afroalpine	Moorland and grassland, used for tourism
ii). Climate	Forests and derived grasslands –suitable for intensive agriculture
iii). Dry sub-humid to semi-rid	Moist woodland, bushland or savanna. The trees are mainly <i>Brachystegia</i> and <i>Combretum</i> . Land not of forest potential but of high agricultural potential (e.g. wheat farms). Very high livestock potential
iv). semi-arid	Dry forms of woodland or savanna often with <i>Acacia</i> trees associated with <i>Themeda triadra</i> grass. Marginal agricultural

	potential but high wildlife and livestock density, hence high tourism potential.
v). Arid	Dominated by <i>Commiphora</i> , <i>Acacia</i> and other shrub species while grasses are <i>Cenchrus ciliaris</i> and <i>Chloris roxburghiana</i> . Land not suitable for agriculture used mainly by livestock and wildlife.
vi). Very arid	Dwarf shrub grassland and shrub grassland mainly <i>Acacia reficiens</i> confined to water courses with main perennial grass being <i>Chrysopogon aucheri</i> , however dominated by annual grasses.

The largest length of the transmission line is in ASALs was in AEZ VI, V and IV. The vegetation types observed varied from bushland, woodland, shrubland to shrub grassland. The key differences between these types being the proportion of wood to grass cover and average vegetation height.

The dominant woody species were largely similar to those described in table above. In general the dominant woody species starting from the driest zones were *Acacia recifens/A. horrid*, *Dobera glabra*, *Salvadra persica*, *Commiphora Africana*, and *Acacia Senegal*. As for grasses there would appear to have been a shift in dominant species especially where the species were *Themeda triadra*, *Cenhrus ciliaris* and *Chloris roxburghiana*. This trend has been noted in other rangelands as well and is attributed to intense use, changes in fire regines and climate change.

Hilltops have small patches of remnants forests but clearing for agricultural land and charcoal burning has left only patches and corridors of forest along ranges, rivers, and ravines, and hilltops. The vegetation types in this study were classified according to Pratt and Gwynne (1977) as shown below;

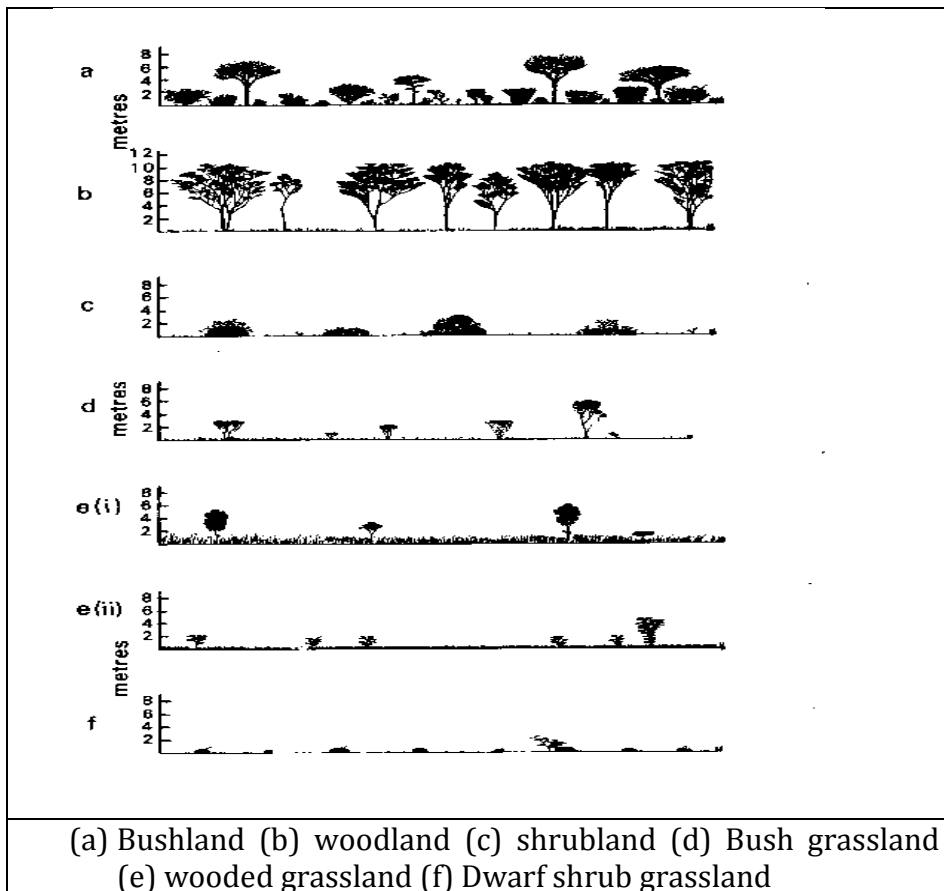


Figure 2. above: Vegetation classification according to Pratt and Gwynne (1977)

The most widespread vegetation type is semi-arid deciduous thicket and bushlands, particularly Acacia/Commiphora associations in the 800 to 1,200 m elevation range. In the dry areas below 900 m, Commiphora/Sanseveria thorn bush grades into semi-desert vegetation. However, near the coast, dryland tropical forests dominate.

The vegetation along the transmission line is generally made up of bush-land and shrub-land. While there are some little disturbed habitats there also areas that are heavily to moderately settled.

4.1.5 Habitat Structure and Species Diversity in the Study Area

4.1.5.1 Methodology of assessment

The methodology for assessment of environmental impacts and sampling design of the proposed OHTL was developed based on national, regional and international guidelines, some of which include;

- ✓ International Finance Corporation (IFC) and World Bank Group: Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007)
- ✓ A Standard Approach to Ecological Impact Assessment of High Voltage Transmission Projects (www.eirgid.com, 2012);
- ✓ Environmental and Social Impact Assessment Guidelines for Transmission Infrastructure for the South African Power Pool region (2010).
- ✓ International Best Practices for Assessing and Reducing the environmental Impacts of High-Voltage Transmission Lines (Williams, 2003)

To make a quantitative assessment of ecological and land use parameters outlined above the following approach was used; (a) Prior to the field data collection the length of transmission line was divided into **7 sections** based on rough similarity in agro-ecological zone, land use, vegetation, and topography . This was done with aid maps on agro-ecological zones, vegetation, soils and Google earth maps. (b) Within each of these sections **sampling points** were located to capture refined variation in land use, vegetation, topography and human population density. (c) Within each of the sections, secondary data (existing resource maps, Google maps, previous published studies and surveys) were used to identify areas that might be ecologically sensitive (in reference to threatened species and habitats, protected areas, wetlands etc.) (d) Vegetation characterization data was collected on standard replicated 20mx5m transects, a species list was also compiled (f) Fauna was observed, pellets of wildlife were identified where possible and local residents knowledge on wildlife in the area sort. The stratification and sampling of the OHTL in accordance with the above criteria is as shown in Table 7.

Table 8. Ecological parameters sampling design

Section Identify	Section description	Description	Data collection points
A	A18 to A17 (Sub-station, Embakasi, Katheka, Kithimani)	<ul style="list-style-type: none"> • AEZ IV • Mixed livestock and cropping systems 	Sub-station, A18, A17
B	Past A17 and A16 (Matuu area)	<ul style="list-style-type: none"> • AEZ V • Predominantly small scale livestock with dryland cropping 	A16b, A16c, A16,
C	A15 area (Kitui area)	<ul style="list-style-type: none"> • AEZ III • Increased altitude • Agroforestry, fodder, fruit trees, 	A15, A15b, A15c
D	A14 to A10 (Tana River County dry zone)	<ul style="list-style-type: none"> • AEZ VI • Dry shrubland 	A8, A9b, A9c

		<ul style="list-style-type: none"> • Denser vegetation in the laggas • Pastoral grazing, wildlife 	
E	A7 (Tana River ecosystem)	<ul style="list-style-type: none"> • Settlement (E1) • Cultivated belt (E2) • Flood zone woodland (E3) 	Section E1: A7 Section E2: 8b Section E3: 8c
F	A6, A5 to A4 (Masalani – Ijara)	<ul style="list-style-type: none"> • AEZ VI • Dry shrubland • Pastoral grazing, wildlife 	A7b, A6-A7, A5, A4
G	After A4 to A1 (Lamu area)	<ul style="list-style-type: none"> • Coastal humid climate and patches of forest 	A4,A3,A2,A1

4.1.5.2 Dominant species, plant density, and vegetation structure

Table 9 below, provides the structure of vegetation types in each section of transmission line following field data collection and analysis of field.

Table 9. Vegetation types in respective section of the L-NE OHL

OHTL Section	Vegetation	AEZ (7 classes)	Dominant woody species	Wood y Density (per ha)	wood y cover %	Avera ge ht	Groun d cover (%)
A	Bushland	IV	<i>Acacia senegal</i> <i>Acacia xanthophloea</i> <i>Lantana camara</i>	1000	25	3	20
B	Bushland	V	<i>Commiphora africana</i> <i>Combretum molle</i> <i>Acacia mellifera</i>	750	35	2.8	15
C	Silviculture	III	<i>Grivellia robusta</i> <i>Mangifera indica</i> <i>Lantana camara</i>	600	40	7	20
D	Dry Shrubland	VI	<i>Acacia reficiens</i> <i>Grewia tenax</i> <i>Dobera glabra</i>	1350	45	4	5
E1	Tana Riparian zone	Settled	<i>Prosopis juliflora</i>	350	10	3	3
E2	Tana River cultivated zone	River Flood Zone	<i>Mangifera indica</i> <i>Musa sapientum</i> <i>Prosopis juliflora</i>	700	58	9	15
E3	Tana Riverine woodland	Tana Riparian zone	<i>Combretum aculeatum</i> <i>Prosopis juliflora</i> <i>Gnidia latifolia</i>	1645	40	4	40
F	Dry shrubland	VI	<i>Acacia recifens</i> <i>Dobera glabra</i> <i>Commiphora africana</i>	800	35	4.5	5
G	Coastal sub-humid	III	<i>Thespesia danis</i> , <i>Diospyros cornii</i> , <i>Hyhaene compressa</i>	410	30	6	45

The highest density of woody plants was observed in the woodlands of the Tana River. Generally the density and cover of woody species relative to herbaceous species increases with increasing available soil moisture. The dominant species in an ecological zone is result of its ecophysiological traits that determine its adaptations in resource acquisition, water and temperature stress and herbivory. In the vegetation types along the OHTL *Acacia recifens*, *Dobera glabra*, *Grewia tenax*, and *Acacia horridi* were most dominant in the most arid conditions while *Acacia Senegal* and species of *Combretum* were dominant in less arid conditions. A discussion of the structure of vegetation types found each section is presented below;

Section A: This area consists of the sub-station area in Embakasi, and the Katheka and Kithimani areas in Machakos County. This section of the OHTL is in AEZ IV. The zone is semi-arid and suitable for livestock production and wildlife conservation. Indeed most national wildlife parks in the country are in this zone. The zone has marginal potential for agriculture and is only suitable drought resistant crops. The ‘climax’ vegetation type is woodland, bushland or savanna formation dominated by *Acacia* species and associated with *Themda triadra*. The physiognomy and relative species composition can highly by the effects of fire and heavy grazing.

From field observations the Embakasi area consisted of bushland dominated by *Acacia Senegal* and predominantly utilized for livestock production. The general vegetation height is 3m largely dictated by *Acacia Senegal*. Quarry activities were also widespread. The quarries cause soil disturbance which leads to changes in plant species with increased presence of invasive species such *Latana camara*, *Casuarina glauca* , *Solanum incanum* and others.



Plate 3 The general vegetation at Embakasi sub-station area. Dominate species *Acacia senegal*



Plate 4. Mango orchard at Kithimani (A17): Farming consists drought resistant crops and fruit trees

Beyond the sub-station area of Embakasi is a zone where dryland farming is intensely practiced mainly the Katheka, Kithimani and general Mwala area. The land is owned in small parcels and farming consists of drought resistant crops such as sorghum, maize, fruits and apiculture.

Section B: This consists of area past A17 and A16 or the Matuu area which falls under AEZ V and drier than the one above.

The zone is not suitable for rain-fed agriculture and was found to be mainly used for livestock production by small scale holders. There was however small patches of crop fields of drought resistant crops. The vegetation is classified as bushland with woody species density of approximately 750 individuals/ha. The dominant species are *Commiphora africana*, *Combretum molle* and *Acacia mellifera*. The average height the wood layer is about 2.8m.



Plate 5. The general vegetation of section B, dominated by *Commiphora africana* and species of *Combretum* and *Acacia*



Plate 6..Section B: Generally used for livestock grazing, note signs of heavy grazing

The dominant grasses are *Chloris roxburghiana* and *Digitaria macroblephera*.

Section C: This section represents the area of increased altitude as the OHTL transverses the Kitui hills area. The section has increased rainfall and AEZ III. The land is not of forest potential but of high livestock and agricultural potential. The land is sub-divided into small parcels and there is widespread planting of agro-forestry trees especially *Grivellia robusta*. Human population density is also higher than the previous sections. Crops planted include maize, beans, cow peas, bananas among others. Fruit trees are a common enterprise especially *Mangifera indica*. The density of trees including fruit trees and agro-forestry species was approximately 600 individuals/ha. The average height of the woody vegetation was 7m, an indicator of the high potential.

Section D: The section represents the vegetation type through which the OHTL transverses the longest. The Agro-ecological zone of this section is VI which is the 2nd driest zone in Kenya and is classified as very arid. The vegetation was found to dry shrubland dominated by *Acacia reficiens*, *Grewia tenax*, *Dobera glabra* and *Acacia horridi*. The vegetation forms an almost uniform layer with a shrub density of 1350 individuals/ha. The density however varies and highest on seasonal water courses (luggas). The zone is only suitable for pastoral livestock grazing with herds composed largely of browsers such as goats and camels.



Plate 7. Section D: Dry shrubland with almost uniform stature dominated by *Acacia reficiens*, *Grewia tenax*, *Acacia horridi*

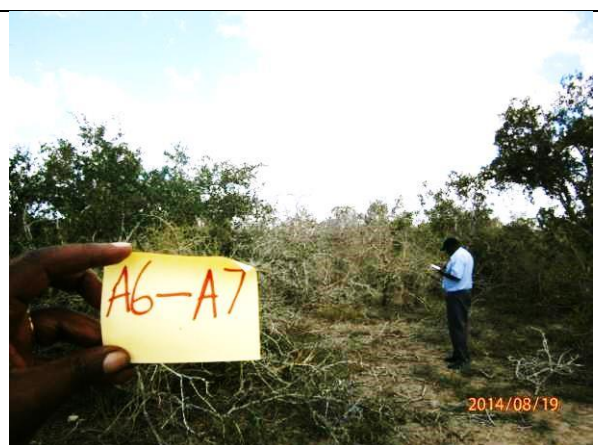


Plate 8. Section F: Dry shrubland similar to section D but higher relative density of *Dobera glabra*, *Commiphora africana*

Section E: The Tana River ecosystem was considered the most ecologically sensitive due to habitats in both the upper and lower flood plains being home to some endemic species. In this case important issues were over what habitats the OHTL traverse does and at what angle does the line cross the ecosystem so as to minimize impacts. The OHTL was found to cross the ecosystem

between points A7 and A8 perpendicularly. An assessment indicated 3 distinct vegetation/land use types across the river in the path of the OHTL (Table 10 below).

Table 10. Vegetation/land use zones across Tana River traversed by the OHTL

Vegetation/land use	Description
E1 On the eastern bank	Not subject to flooding. The OHTL passes over the Pokomo village named Majengo. The community resides in this village but carries farming activities across the river on the western side. The village largely consists of mud wall houses. The village and its environs are heavily invaded by <i>Prosopis juliflora</i> .
E2 Cultivated zone adjacent to the western river bank	The zone receives frequent flooding that enables crop production. Cropping consists of fruit trees, especially mangos, bananas, and horticultural crops for the export market. Some parcels have been rested to regain fertility.
E3 Woodland after the cultivated zone	The zone is not frequently flooded. It consists of low stature woodland of <i>Gnidia latifolia</i> , <i>Ficus sp</i> , <i>Combretum aculeatum</i> . Where there are rested crop fields there is heavy invasion by <i>Prosopis juliflora</i> .

It was observed that cropping system consists of rest rotation or shifting cultivation practiced by the Pokomo tribes in sections of the Tana River bank. A family unit will tend to have more than one field, one being used for fruit trees and 2 or 3 under a rest rotational system to allow recharge of fertility from flood waters. The section traversed by the OHTL shows a serious environmental problem resulting from invasion by *Prosopis juliflora*. *Prosopis juliflora* is native to Central America and was introduced in the 1980's through rehabilitation and afforestation projects (Mwangi and Swallow, 2005) as well as livestock fodder production projects. *Prosopis juliflora* was noted to be increasing in most riparian zones of the major rivers traversing arid areas of Kenya including the Turkwel, Ewaso-nyiro and Tana in the last 2 decades (Stave *et al.*, 2003). Studies by Mworira *et al* (2011) indicate that both livestock and wildlife species play a critical role in dispersal of *Prosopis juliflora* and that its regeneration is higher in successional vegetation of rested crop fields than undisturbed habitats and also inside the floodplain than outside.



Plate 9. Section E. Majengo village on the eastern river bank where the OHTL crosses (E1)



Plate 10. Section E. Regularly zone on the western side (E2)



Plate 11. Section E. Woodland zone, not regularly flooded with heavy invasion by *Prosopis juliflora* (E3)

Section F: This section between Masalani and Ijara and slightly past is similar to that of section D but of higher stature (average height 3.5m) and greater relative density of *Dobera glabra* and *Commiphora africana* (see platexx). This is attributed to increasing moisture on approaching the coastal zone. The vegetation is almost uniform in stature and composition with minimal anthropogenic alterations. The main land use is livestock production in particular browsers such as the goat.

Section G. In this section the coastal climate characterized by increasing humidity and moisture modifies the vegetation structure and composition. Lamu has 3 distinct ecological Zones, namely: Northern and Western- bushed grasslands ; Eastern Boni Forest; while South and South East Coastal vegetation comprises of coral reef, coconuts and thick shrubs. The OHTL largely traverses the bush grasslands zone and does not cross the Boni which is farther north. Along the OHTL the vegetation shows a gradual change from dominance by *Acacia recifens* and *Dobera glabra* to increasing relative density of *Thespesia danis*, *Diospyros cornii*, and *Grewia plagiophylla*. *Thespesia danis*, a tree found mainly on forest margins, secondary bushland and wooded grasslands (Beentje, 1994). It may therefore be an indicator of disturbance or edge effects as a resulting from fragmentation. *Diospyros cornii* is a coastal tree species that grows to about 15m species is locally common in the general study area. In the coastal zone the doum palm (*Hyphaene compressa*) also increases in relative density. Cashew nuts are commonly planted as a source of revenue.



Plate 12. Section F. General vegetation, bushed grassland with doum palm emergents



Plate 13. Section F. Cashew nut, revenue generation

4.1.5.3 Species occurrence and diversity

An inventory of species richness in the various sections and ecosystems on the route of the OHTL was done. Species richness is a count of the number of plant species in a quadrat, area or

community. Species richness is used of diversity however a species diversity index on the other hand has 2 components: first is species richness and second is the relative abundance (evenness or unevenness) of species within a community. Alpha diversity is the number of species within an area or community e.g. a grassland Beta diversity is the difference in species diversity between areas or communities. Many indices of diversity have been devised. Among indices that combine species richness and relative abundance, Shannon-Wiener index (H') and McIntosh's diversity index (U) are commonly used.

A total of **172 plant species** were identified (see Annex 1 for the full list). The species consisted of grasses, herbs, forbs, climbers, shrubs and trees. We note that the list is not exhaustive since identification was not done on the entire length of the OHTL but on selected areas in accordance with the sampling design. From the data it is noted that highest total number of species was identified in section A. Section A consisting of the Embakasi, Kithamani, Mwala is in Agro-Ecological Zone IV has 2 key land use types dryland farming and livestock production, the number of species is high as it includes crops, fruit trees, and in particular weeds and disturbance species. The *highest diversity of trees* was found in the Tana River ecosystem and Lamu section. These 2 sections represent the areas with highest available soil moisture; in the Tana has a result of flooding while in Lamu zone as a result of higher rainfall.

4.1.6 Fauna

The TL will **not traverse areas designated as National Parks or Reserves**, therefore, the project will not pose any significant impact on fauna or biodiversity of habitats in protected areas. Designated animal protected areas near OHTL include; Mwingi North Wildlife Reserve, Tana River Primate Reserve in Tana River, and Kiunga Marine Park. The consultant assessed the distance between these protected areas and proposed OHTL.

Table 11. Distance between wildlife Protected Areas and the OHTL

County	Protected Area	Distance to OHTL (Km) (Approximate)
Machakos County	Ol Donyo Sabuk	5
Kitui County	South Kitui Reserve	15
Tana River county	Tana River Primate Reserve (TPRS)	17
Garissa County	Arawale National Park	16
	boni	43
Lamu County	Kiunga Marine Park (KMP)	
	Dadori	23

The common fauna found in these parks can be classified into; a primate, large and small herbivores, birds, reptiles, snakes among others.

Even if the OHTL does not pass through protected areas it passes through large tracts of natural habitat occupied various fauna, the consultant recorded species observed or informed by local residents during the fieldwork and they included; (a) *Mammals*: Squirrels, Dik Dik, Honey Badger, Mongoose, Common Zebra, Reticulated Girrafe, Buffalo, Hyena, Hare, Yellow Baboon, Impala, Harts Gazelle (b) *Birds*: Hawks, Starlings, Guinea Fowl (c) *Reptiles*: Chameleon, Tortoises,

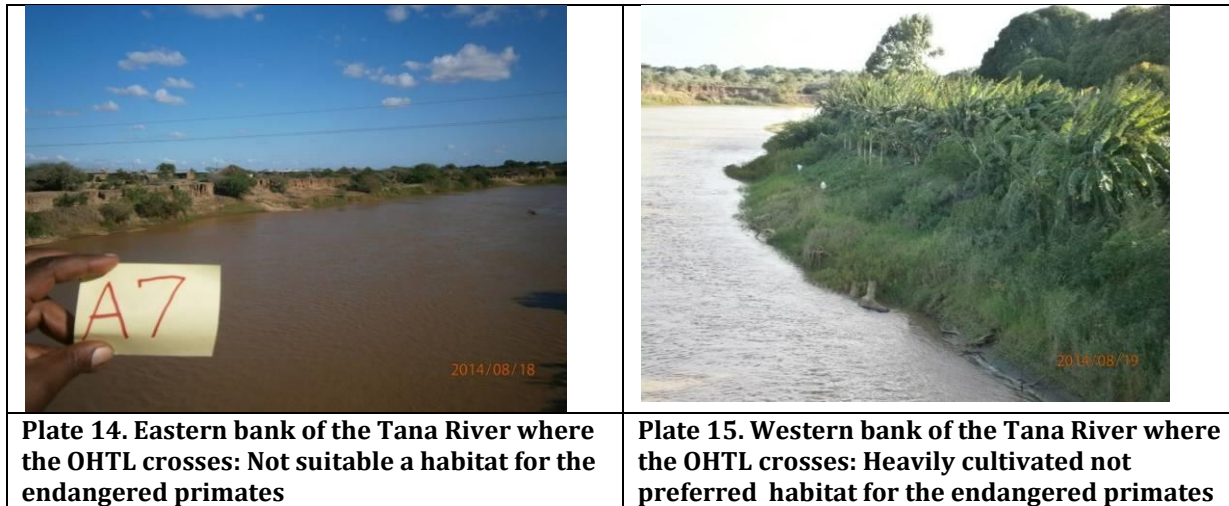
4.1.7 Threatened Species and Habitats

After describing the types of habitats and their structure and identifying plant and animal species on the proposed OHTL (see section 4.1.5) the aim of this section is to determine whether if any one of them can be classified as a threatened habitat or species. A critical habitat (IUCN 2013) is in part one that is home to a threatened or endemic species. A threatened species is one that is facing extinction in the wild. As noted above OHTL does not traverse a Protected Area; however critical habitats and threatened species do occur outside or adjacent to protected areas.

To determine the occurrence of threatened species whether plant or animal we referred to the red list IUCN (2013), which showed that in the lower Tana Rvier flood plain the following species were listed; Tana red colobus (*Procolobus rufomitratu*s); Tana crested mangabey (*Cercocebus galeritu*s) and plant species include the Tana river poplar (*Populus ilicifolia*) while in the upper Tana there is Hirola (*Beatragus hunteri*). The range of Hirola whose eastern most range encompasses the upper Tana River ecosystem near Garissa is not touched and OHTL poses no threat to this endangered antelope.

The ESIA's study experts concluded that OHTL poses minimal threat to the two endangered primates after assessing three critical parameters; their preferred habitat, the location of those habitats and food resources of the primates. (a) We compared the structure of their habitat with the one over which the OHTL will traverse. The habitat of Tana red colobus and Tana crested mangabey is restricted to an isolated mosaic of levee forest patches along the lower floodplain of the Tana River (Medley, 1993). The forests are multi-layered with a tall (10m) stature. The habitats crossed by the OHTL consist of a settlement, crop cultivation zone and low stature monolayer woodland (4m). We conclude the 2 to be very significantly different and that the one crossed OHTL is not a preferred habitat (b) the preferred habitats of two primates is further south in lower flood plain (c) The 15 key food species of the two primates described by Medley (1993) and later by Wieczkowsk, (2004) were largely not found (except *Ficus sycomorus*) in habitats to be traversed by the proposed OHTL.

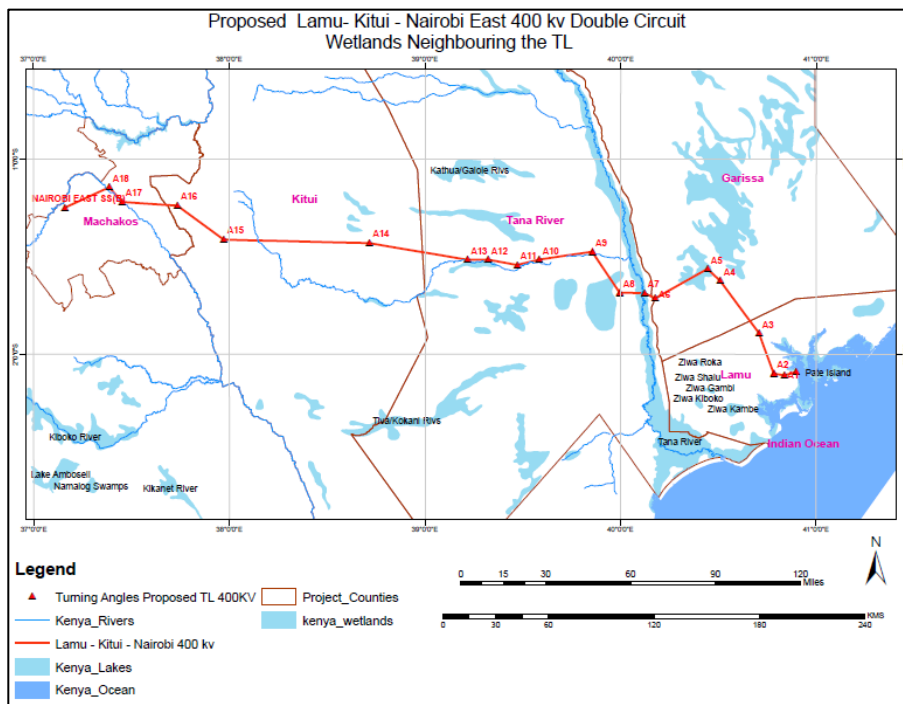
Finally endemic the plant species *Populus ilicifolia* is found in the outer edge of the levee forest belt and point bar vegetation, which are in lower flood plain not where the OHTL passes. Further the species was not identified in the inventory carried out on the path crossed by the OHTL. We again conclude the *OHTL poses no threat to the habitat of the endemic plant Populus ilicifolia*.



4.1.7 Wetlands Traversed by OHTL

Wetlands are lands that are either permanently or seasonally saturated with water and have characteristic vegetation adapted to the soil conditions. The role of wetlands in flood control, water purification and high biological diversity makes them very important. Types of inland wetlands in Kenya consist of; (a) Riverine, which can be perennial (permanent rivers, inland deltas, intermittent rivers) or intermittent floodplain wetlands (b) Lacustrine these are permanent, seasonal or saline and (c) Palustrine consisting permanent fresh water swamps which can be forest or shrub.

Map 6 below, provides wetlands zones traversed by L-NE OHTL .



Map 6 above: Wetlands that will be traversed the OHTL.

There are two types of wetlands that will be traversed;

- *Riverine wetland*: these are on Tana River and Athi River and are crossed by the OHTL at Masalani and Kabaa respectively. The vegetation, land use, species composition and habitat stratification of the three identified zones on Tana River have been discussed above (section D of the OHTL). The major land uses of this riverine wetland are large scale farming, irrigation, conservation. The most critical pressures on this wetland are inappropriate land use, overutilization of water, conversion of land to agriculture, overstocking of livestock, reduced water levels. The impacts of these pressures are pollution, soil erosion, overgrazing and reduced water volume (GoK.2012. Kenya Wetlands Atlas. Ministry of Environment and Mineral Resources, Kenya. Progress Press Co Ltd, Malta)
- *Palustrine shrub dominated swamps*: These occur on the east of Tana River between Masalani and Ijara, the habitat structure, species composition, and stratification were assessed and are described above (Section F of the TL). A small section of a similar swamp is also crossed on the western side of Tana River. These types of swamps are used by pastoralists as a dry season grazing area, since they retain high biomass for longer periods.

4.2 Baseline Socio-Economics Situation Analysis

Within the framework of this ESIA Study and as documented in Table 12 below, the socioeconomic issues being addressed in the areas within the scope of this study include: community livelihoods characterised by land use that might be affected by the project; public health issues; cultures and historical heritage issues among other issues of concern.

4.2.1 Population and Human Settlement

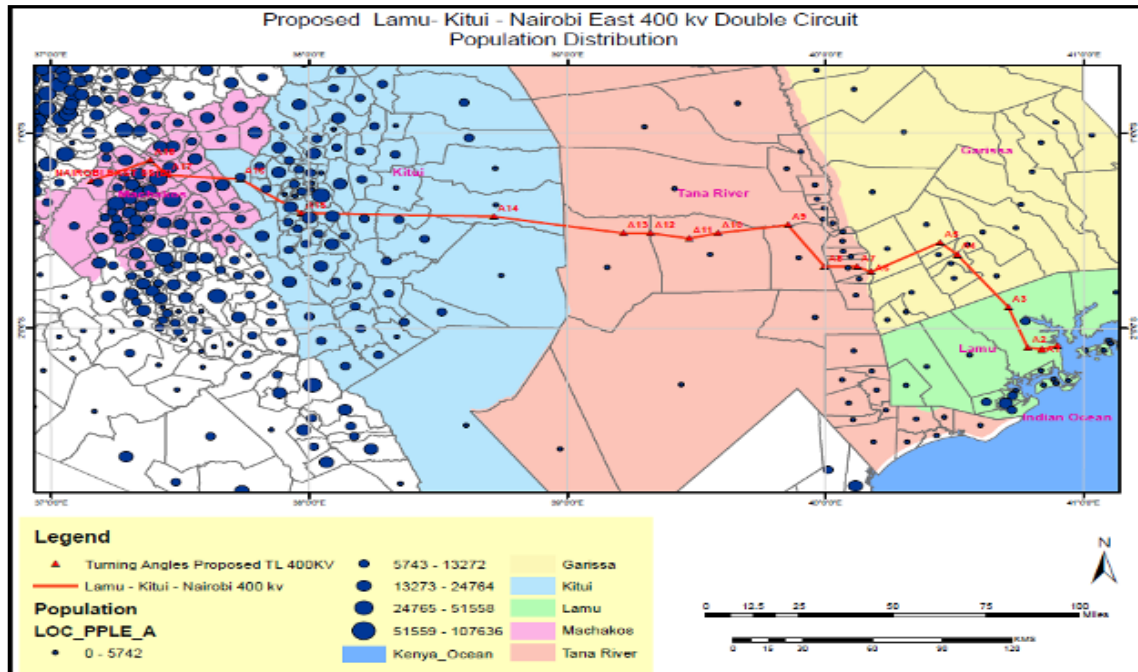
As shown in map,, on the left, the population distribution in terms of numbers and density is higher in Nairobi East including Machakos and Kitui counties and sparse in Tana River, Garisa and Lamu counties respectively. Secondly, higher population clusters and density are concentrated in urban centers, irrigation schemes and Lamu Port. As indicated in the above sections of this ESIA Report, The 400 KV Lamu-Nairobi East Transmission Line avoided as much as possible areas with potential higher impacts in terms of population and destruction of property for instance: settlement schemes,

urban areas and heavy vegetation cover. Hence, the project will have minimum impact of population and livelihoods as illustrated below:

4.2.2 Human Settlement:

Human settlement include permanent and semi-permanent structures, communal villages and temporary structures used by herdsman as move livestock from place to place. The environmental and social issues and associated impacts associated with human settlement are indicated in Section 6 of this ESIA Study Report.

Map 7: The OHL route and population density



4.2.3 Land Use and Livelihoods

Constituencies comprising the Nairobi East OHTL area practice agriculture, trade and livestock, while the population in other constituencies in Tana River, Ijara and Lamu livelihoods revolve around livestock, with cattle, sheep and goats, camels and donkey dominating the socioeconomic activities

Map 8 below, Land use traversed by proposed OHTL

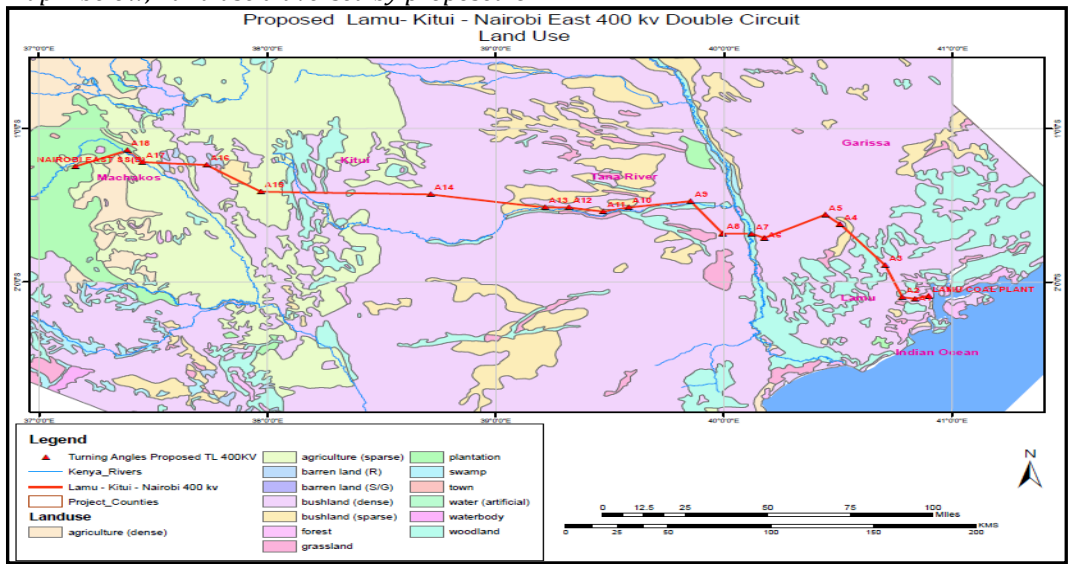


Plate 16 below: Temporary structures at WaiBoroTana River: Given the nomadic nature of Livelihood majority of pastoralist communities in Garisa, Tana River and Lamu Counties live in temporary structures.





Plate 17 and 18 above. Nomadic pastoralism – a major social economic activity in much of the area traversed by the OHTL

As mentioned above and other sections of this ESIA Report, displacement of people within the wayleave areas will be minimal given that the OHTL will occupy only 60 M corridor, secondly, the design of the OHTL itself has avoided where population and property are concentrated. However, in the event that there is a building erected underneath where the transmission line passes, the owners will be required to relocate their buildings and tall vegetation to give way for compensation as need arises. However, the proponent will compensate such designated land in accordance with laid down procedures on land acquisition policy based on mutual agreement with the affected land owners.



Plate 19 Semi-permanent house in Budhei in Lamu County:

4.2.4. Cultural and Historical Heritage

Lamu presents a rich combination of ecosystem with diverse flora and fauna including unique historical and cultural heritage spanning many centuries ago. These rich characteristics made Lamu classified by UNESCO as a World's Heritage Site among few other unique ecosystems in Kenya. However, the OHTL will not originate or traverse the Amu island (Lamu Island) which is classified as UNESCO's world heritage site.

Apart from the graveyards identified in churches in Machakos at Kavaa which will not be interfered with given that the OHTL passes on the side, other sacred sites and trees that identified during the scoping process include: Ancient cultural Swahili structures at Lamu, the *Dobera glabra* and *Chassalia umbraticola* trees that found at Hindi Sub-county Lamu within the proximity of the OHTL, these include the Mangoves trees found along the Indian Ocean shores at Lamu Part Are. During public meetings at Buthei and Bargon the residents stressed their cultural and ritual attachments with the abovementioned trees, hence the need for preservation.

4.2.5. Results of public participation

Public participation forums were held at all Counties. The list of those who attended are presented in annex 2. Discussions were held and subsequently, views documented through minutes. Most stakeholders supported the project. However, the stakeholders also had concerns that they hoped the project would attend to. The views of the public are summarized in the table below.

Table 12. Summary of the feedback during the PPP Meetings

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
Kormarock location. Matungulu sub-county. Machakos county.	Individual ownership although title deeds are yet to be issued.	<ul style="list-style-type: none"> • Displacement. • Immorality. • Marriage breakages • Business increase. • Employment. • Additional value of the land due to the power boosting. • Additional electricity power 	The contractor should source for labour from the locals.
Katheka location. Matungulu sub-county. Machakos county.	Individual ownership with free hold title deeds.	<ul style="list-style-type: none"> • Displacement. • Immorality. • Marriage breakages • Business increase. • Employment. • Additional value of the land due to the power boosting. • Additional electricity power 	The contractor should source for labour from the locals.
Ikumbi location. Kyasoni sub-county. Machakos county.	Individual ownership with free hold title deeds	<ul style="list-style-type: none"> • Displacement. • Immorality. • Marriage breakages • Business increase. • Employment. • Additional value of the land due to the power boosting. • Additional electricity power. • Easier access to electricity. 	Involve the area administration especially when sourcing for labour
Sykitombi location. Matinyani sub-county. Kitui county.	Individual ownership with free hold title deeds	<ul style="list-style-type: none"> • Displacement. • Immorality. • Marriage breakages • Business increase. • Employment. • Additional electricity power. • Easier access to 	Source employment from the local community.

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
		electricity.	
Chuluni division. Kyanika location. Mwembe tayali sub-location. Nzambani sub-county. Kitui county	Individual ownership with free hold title deeds	<ul style="list-style-type: none"> • Displacement. • Immorality. • Marriage breakages • Employment. • Additional electricity power. • Easier access to electricity. 	Source employment from the local community.
Ijara sub-county. Masalani location. Garissa county.	The land is community ranch.	<ul style="list-style-type: none"> • Insecurity due outside and not well-known people coming to work on the project. • Immorality. • Culture interference. • Business during the construction of the line and after due to increased power. • Easier access to electricity. • Employment of the local during the implementation of the project. 	<p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p>
Ijara sub-county. Ijara location. Garissa county.	The land is community ranch.	<ul style="list-style-type: none"> • Insecurity due outside and not well-known people coming to work on the project. • Immorality. • Culture interference. • Business during the construction of the line and after due to increased power. • Easier access to electricity. • Employment of the local during the implementation of the project. 	<p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p>
Hola sub-county. Titila location. Tana river county.	The land is community ranch.	<ul style="list-style-type: none"> • Insecurity due outside and not well-known people coming to work on the project. • Immorality. • Culture interference. • Business during the construction of the line and after due to 	<p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p> <p>Employments.</p>

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
		<p>increased power.</p> <ul style="list-style-type: none"> • Easier access to electricity. • Employment of the local during the implementation of the project. 	<p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p>
<p>Hola sub-county. Wayuboro location. Tana river county.</p>	<p>The land is community ranch.</p>	<ul style="list-style-type: none"> • Insecurity due outside and not well-known people coming to work on the project. • Immorality. • Culture interference. • Business during the construction of the line and after due to increased power. • Easier access to electricity. • Employment of the local during the implementation of the project. 	<p>Employments.</p> <p>Business will be boosted.</p> <p>such Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p>
<p>Lamu county. Hindi sub-county. Hindi magogoni location. Bargon sub-location.</p>	<p>The land is community ranch.</p>	<ul style="list-style-type: none"> • Insecurity due outside and not well-known people coming to work on the project. • Immorality. • Culture interference. • Business during the construction of the line and after due to increased power. • Easier access to electricity. • Employment of the local during the implementation of the project. • Destruction of old trees which are variable to the community as some have medicinal values. 	<p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p> <p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be connected to electricity.</p>
<p>Lamu county. Hindi sub-county. Hindi magogoni location. Hindi magogoni sub-location.</p>	<p>The land is community ranch.</p>	<ul style="list-style-type: none"> • Insecurity due outside and not well-known people coming to work on the project. • Immorality. • Culture interference. 	<p>Employments.</p> <p>Business will be boosted.</p> <p>Schools will be</p>

Area	Status of land ownership	Social issues/ Concerns/ benefits	Community requests
		<ul style="list-style-type: none"> • Business during the construction of the line and after due to increased power. • Easier access to electricity. • Employment of the local during the implementation of the project. • Destruction of old trees which are variable to the community as some are medicinal. 	connected to electricity.

5.0. POTENTIAL ENVIRONMENTAL, SOCIAL IMPACTS AND MITIGATION MEASURES

5.1 Positive Environmental and Social Impacts

Various positive impacts arising from the OHTL projects were identified through scoping process as well as public participation meetings. These include the following:

Employment creation: There will be employment opportunities for both skilled and unskilled labour during all the phases of the project. However, more unskilled labour will be directly employed during the construction phase of the project while the operational phase will required more of the skilled labour.

Availability of electricity to households in increased connectivity especially the marginal areas: The project will ensure a significant injection of additional megawatts to the national grid. This will open up business opportunities for youth and adults such as welding, mechanic and other business enterprises. The power will in addition, enhance and improve learning in schools and at home where pupils will be able to do their homework and learning at night. For example, during public participation meetings in Tana River several residents including those who attended such meeting at Titila Primary School in Titila Location expressed optimism that their school attending children at the only school in the areas (Titila Primary School photo below) will have a chance to pursue education even at university levels as a result of access to electricity in the location.



Plate 20 above: Titila Primary School in Titila Location Tana River County

Plate 21 below: Public participation meeting at Titila Location, Tana River County



Transfer of technology: Some expertise in designing and implementation of the project will be sourced from outside the country. The expats will work alongside local professionals hence building the capacity of the local professionals. The project will therefore create a pool of highly skilled professionals with specialized knowledge that can be used in implementing similar projects in the country and in the region.

Increased reliability and stability of electricity supply and socioeconomic benefits: Once operational, electricity supply in the county will almost be doubled that will largely eliminated instances of power shedding and outages. The outreach by Kenya Power Company will also significantly increase. Availability of more electricity will spur economic activity in both formal and informal sectors.

Enhanced living standards: These are associated with expectations of the residents of villages along the transmission alignment. In the Project area, the information about the Project raised hopes of the villagers of power supply to their villages and anticipation of improvement in their lives. Some started to think of converting flour mills with electricity supply reducing costs of fuel. They also anticipated a rise in trading activities as a result of construction and temporary or permanent employment. The enhanced livelihood opportunities that the electricity connectivity will engender will translate to enhanced living standards through improvement of hygiene, sanitation and incomes through business opportunities such as agri-processing, preserving of meat, fish etc.

5.2 Negative Environmental and Social Impacts

Clearing of natural vegetation and loss of biodiversity: To a large extent, the transmission line will pass through shrubland and savannah grasslands used for ranching and grazing purposes. Throughout the project area the predominant vegetation forms are shrubland and savannah with scattered trees and shrubs. While impact on woody vegetation is going to be permanent, impact on grasses and herbs is mostly transient. However there will only be minimal biodiversity disturbance in these areas as there will be minimal vegetation clearance. The line will not critically affect or fragment this particular habitat.

Impact on fauna including bird strikes: It is well known that transmission lines induce physical hazard to birds and climbing animals. Bird strikes and mortality will be of concern in the areas of their high densities and those areas with large birds such as waterfowl colonies and migratory bird species. However, this may not be of great concern given that the KWS officers who were consulted did not mention existence of bird migratory route along the OHTL corridor. However, this type impact if it arises) during the operation stage of the project will be mitigated by use of reflectory conductor wire types which improve visibility for the birds. However, the impact of a transmission line on fauna especially all species of wildlife is limited given that the OHTL does not traverse any of the designated National Parks or Reserves in Kenya.

Noise pollution: Noise will arise from blasting operations, the helicopter, clanging of the steel structures, movement of Lorries, tipping of loads and noise from motorized equipment. During operation, Corona and Aeolian noises are special noises which are a major consideration for overhead lines operating at voltages of more than 220 KV. The fittings will be designed or screened so that only corona on the conductors is a potential source of audible noise. There will be no danger factor and no special measures will be considered. Aeolian noise occurs under certain wind conditions and is caused by the wind striking on the different components of a line, e.g. steel towers, conductors and insulators. The occurrence of Aeolian noise from the various components of high-voltage line is uncommon, since the conditions under which the noise occurs are very specific.

To minimize noise pollution, construction will be done strictly during day time, 7:00am-6:00 pm; this will include switching off idle machineries.

Dust pollution: Dust emission will be mainly from tower foundation excavation and trucks ferrying materials, during clearance of vegetation and during concrete mixing. For example, working with cement, ballast and sand will create dust pollution within the immediate environment. Dust

will largely affect the construction crews except along the roads when Lorries are transporting the construction materials.

Impeded drainage and soil erosion into water resources: Transmission lines may have both short-term and long-term impacts on water resources. Earthworks might release suspended particles in the water which could have temporary detrimental effect on water. No potential impacts are anticipated affecting surface or underground water resources.

Wetlands: The OHTL crosses two types of wetlands; riverine wetlands (Tana River and Athi River) and two small patches of dryland palustrine shrub swamps. Wetlands can be affected through; removal of vegetation, compaction of soils by machinery, construction equipment can stir fish and other aquatic life, OHTL can be collision obstacles for water fowl and other water birds, vegetation disturbance can facilitate invasion by undesirable non-indigenous species such as *Prosopis juliflora*.

Solid waste generation: During the construction period, solid waste will be generated from the actual construction activities (packaging materials, excess materials, recovered materials, among other waste) and from the workforce itself (waste in the form of food, wrappers, bottles, containers, cartons, and other disposable or personal items). The workforce on site at any given time is relatively small to generate significant waste of high proportions. However, remedial measures will be put in place and sustainably managed including addressing health and safety threats, possible impact of immigrant workers, together with impact on aesthetic values. Other waste materials associated with the OHTL such as cement bags, left over, pieces of conductors, and conductor reels will be collected and burnt using appropriate precaution measures to avoid spread of fires as well as massive smoke. Site offices demolition will create some debris that could litter the environment. To mitigate this sort of impact, an elaborate disposal of solid waste should be put in place within the prescribed regulations of the EMCA 1999 and Regulation 2003.

Hazardous material spills: Potential for hazardous materials and oil spills associated with heavy equipment operation and fueling activities. Hazardous materials in this sector include insulating oils / gases and fuels.

Electric and magnetic fields (EMF): EMF is invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Magnetic fields pass through most materials and are difficult to shield. Both electric and magnetic fields decrease rapidly with distance. The research to date has uncovered only weak and inconsistent associations between exposures and human health and no plausible biological mechanism by which exposure to EMF could cause disease.

Visual intrusion: The pylons are generally viewed as a visual pollutant as they drastically modify and interrupt the view once put up. Visual intrusion will be much more so in the flat dry valley terrain between where the pylons will tower above everything else and will be visible from a considerable distance.

Land Acquisition: The transmission line project would lead to acquisition of land and resettlement of those whose structures lie within 60 meters width and demolished to give way for the project.

Disruption in social economic setup: The Nairobi-East section of the OHTL within the right of way will affect few housing structures and individual fences at Komorock in Matungulu and Yatta constituencies. Other activities likely to be affected include farmlands and grazing land in almost the entire OHTL. During the construction period, some of these properties will be affected causing some limited disruption in the socio-economic situation of the project area communities. Given

that the WayLeave section of the OHTL will be limited to an area of only 60 meters (30-30 meters both ways), the level of impact on both ecological and socioeconomic livelihoods will be very limited as residents will continue with their cultivation and livestock grazing underneath the OHTL.

Interference with cultural setup: Electricity will open up the area for all types of businesses including shops opening late at night, services industry such as hotels, entertainment facilities, butcheries, hospitals and schools among others. However, during public participation meetings, there were concerns of migration of businessmen and women in the urban centers with resultant impact on cultural interference, immorality, divorces and other social ills also arising from OHTL construction workers within village sites where the TL traverse. Local institutions and leaders will be involved in advocacy and awareness campaign educate residents of negative impacts and dangers associated with urbanization and exposure to health, morality and cultural heritage, for example HIV/AIDS, alcohol among other ills.

Interference with sites of cultural heritage: Presently the National Museums of Kenya does not have records in their database of heritage sites in the project area. However, this does not mean that such sites do not exist. However, the scoping process was able to identify some cultural sites and specific ritual plants which will be preserved during construction process. In an interview, the NMK advised that the identification of such sites must determine through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5, Subsection

Occupational safety and health concerns: The fact that casual workers will be involved in providing labour during construction phase of the project there will interaction with local residents. Some of occupational health and safety concerns likely to arise as a result of construction and operations of the proposed facility are minor accidents associated with operation of machines such as excavators. During construction, there will be increased risks of accidents to the pylon riggers who will be forced to work from heights of up to 30 meters high. Improperly erected pylons could topple during construction and operation phase of the project with grave negative social, economic and environmental impacts due to their size, weight and the high voltage the conductors they suspend carry. Many of the pylons in the flat areas will be erected in areas of shallow soil with firm rocky surface.

Risks to low flying planes:

The pylons and conductors will pose a risk to low flying planes. Upon commissioning of the project, there will be risks of electrocution to workers who maintain the line and to boys who might scale the pylons for adventure or to satisfy their inquisitive instincts.

Increased cases of vandalism: The vice of vandalizing of metal from installed infrastructure is a widespread problem in the country. There is a risk that the installed pylons will witness the upsurge of the vice in the project area.

Fire outbreaks: The OHL line passes through a dry area and there is risk of fire outbreaks in case of a short circuit in the lines. The substations also will face risks of fire outbreaks due to electrical faults and presence of inflammable substances such as oil.

5.3 Impact Analysis and Mitigation

5.3.1 Analysis of impacts

The potential impacts of the proposed project are analyzed in Table 13 below and are based on information gathered during the five-week's public and stakeholders interviews and focus group discussions (FGD) in the 5 Counties covered by the L-NE OHTL. The views, perception so obtained

are documented ‘verbatim’ and also from the point of the ESIA study teams previous experience in undertaking similar projects.

Table 13 below: Temporal and spatial analysis of project impact and their scale
The potential impacts of the proposed project are analyzed in Table 9 based on stakeholders’ views, perception and consultant’s previous experience in undertaking similar projects.

Table 13. Temporal and spatial analysis of project impact and their scale

Impact	Direction : Positive Negative	Scale: Major Moderate Minor	Impact duration: Temporary Permanent	Extent: Local National Regional International	Occurrence: Construction Operation Decommissioning
Employment creation	Positive	Major	Permanent	Local and nationally	Construction, operation and decommissioning
Availability of electricity to households and increased connectivity	Positive	Major	Permanent	Local	Operation
Transfer of technology	Positive	Moderate	Permanent	National	Construction
Increased stability in electricity supply	Positive	Major	Permanent	National	Operation
Enhanced economic activity	Positive	Major	Permanent	Local, Regional and international	Operation
Enhanced living standards	Positive	Moderate	Permanent	Local	Operation
Clearing of vegetation and loss of biodiversity	Negative	Moderate	Permanent	Local	Construction and operation
Hazard to fauna including bird strikes	Negative	Minor	Permanent	Local, regional and international	Operation
Noise and dust pollution	Negative	Minor	Temporary	Local	Construction
Impeded drainage leading to soil erosion into water resources	Negative	Minor	Permanent	Local	Construction and operation
Wetlands	Negative	Moderate	Permanent	Local	Construction and operation, decommissioning
Solid waste generation	Negative	Minor	Permanent	Local	Construction, operation and decommissioning
Hazardous material spills	Negative	Minor	Permanent	Local	Construction, operation and decommissioning
Electric and magnetic fields (EMF)	Negative	Minor	Permanent	Local	Operation
Visual intrusion	Negative	Major	Permanent	Local	Construction, operation and decommissioning

Land acquisition	Negative	Major	Permanent	Local	Construction, operation and decommissioning
Disruption in social economic setup	Negative	Major	Permanent	Local	Construction
Interference with cultural setup	Negative	Moderate	Permanent	Local	Operation
Interference with cultural heritage	Negative	Minor	Temporary	Local	Construction, operation, and decommissioning
Occupational safety and health concerns, including electrocution	Negative	Major	Permanent	Local	Construction, operation and decommissioning
Risk to low flying planes	Negative	Major	Permanent	Local	Operation
Increased cases of vandalism	Negative	Major	Permanent	Local	Operation
Fire outbreaks	Negative	Major	Permanent	Local and regional	Operation

5.3.2 Mitigation measures for negative impacts

Table 14. provides a snapshot of the adverse impacts and proposed mitigation measures.

Table 14. Proposed mitigations for adverse impacts

Potential negative impact	Mitigation measures
Clearing of vegetation and loss of biodiversity	<ul style="list-style-type: none"> • Compensate by planting of trees on roadsides and avenues and in other public places such as schools • Undertake selective clearance to target only tall trees and shrubs and avoid clearance of short annual herbs • Adhere strictly to prescribed dimensions in clearing of vegetation • Monitor the biodiversity index over time in the project areas
Hazard to fauna including bird strikes	<ul style="list-style-type: none"> • Desist from any form of hunting of game for trophies or food • Cart away any waste • Mark some of the wires to make them more visible • Erect perching platforms on top of pylons • Monitor number of electrocuted birds and those lost to collision and compare with published data to make decision on effectiveness of measures taken
Noise and dust pollution	<ul style="list-style-type: none"> • Obtain necessary authorization if blasting is to take place • Provide appropriate PPEs to workers (dust masks and noise mufflers)

Potential negative impact	Mitigation measures
	<ul style="list-style-type: none"> • Organise deliveries to avoid constant noise irritation and train workers on good practices of minimizing noise generation such as: turning off idle machines, avoiding hooting, gentle off-loading, use of properly maintained machines, and installation of mufflers on machinery • Next to settlements, restrict construction to daytime • Exercise discipline in areas next to schools and clinic • Deliver construction materials early in the morning when it is less windy and the materials are damp with dew • Use low speeds while delivering materials • In case of excessive dust, sprinkle materials and working areas with water • Supervise workers to ensure they work away from drifting dust
Impeded drainage leading to soil erosion into water resources	<ul style="list-style-type: none"> • Plan construction to coincide with dry weather • Minimize use of heavy equipment by favouring human labour • Avoid dragging of construction material on the ground to deter creating of soil erosion channels • In heavily compacted areas, such as lorry tracks, offloading sites and assembling points, disturb the soil, then mulch it to encourage quick plant regeneration • Cut back the vegetation rather than outright clearance such that the soil is held by the stumps • Do not disturb river banks whatsoever • Use properly serviced equipment and take particular caution when working next to a river • Limit soil erosion (see preceding section) • Sensitize workers not to dump any waste into rivers • Monitor soil erosion levels and compare with published data for need to undertake additional corrective measures
Wetlands	<ul style="list-style-type: none"> • Design OHTL route to cross wetland perpendicularly to minimize impact • Adhere strictly to prescribed dimensions in clearing of vegetation • Clean construction equipment after working in areas infested by invasive species. • Place markers on the top (shield) wire to make the lines more visible to birds if the collision potential is high. • Monitor the biodiversity index over time in the project areas
Solid waste generation	<ul style="list-style-type: none"> • Proper quantification of requirements to avoid

Potential negative impact	Mitigation measures
	<p>redundancies of ordered materials</p> <ul style="list-style-type: none"> • Use of high quality, long lasting and well maintained electrical equipment materials • Segregation of solid wastes to encourage recycling / reuse at substations • Monitor amount of waste generated per given period with a view of continuously reducing the waste generated
Hazardous material and fuel spills	<ul style="list-style-type: none"> • Spill prevention: • Emergency response: • Clean up and contaminated soil remediation:
Electric and magnetic fields (EMF)	<ul style="list-style-type: none"> • Installation of transmission lines to avoid residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or hospitals) • Taller double circuit poles resulting in less of a magnetic field at ground level.
Visual intrusion	<ul style="list-style-type: none"> • Create public awareness before construction of pylons • Where feasible use the hilly terrain to locate pylons in a way that will mask the visual intrusion
Land acquisition and disruption of social economic setup	<ul style="list-style-type: none"> • Implement a resettlement assessment plan • Civic education, public awareness, and sensitization on alternatives targeting where applicable both spouses • Issuance of adequate notices • Expedited compensation
Interference with cultural setup	<ul style="list-style-type: none"> • Raise public awareness on the values of culture • Support social activities that promote the local cultures through the CSR avenues
Interference with cultural heritage	<ul style="list-style-type: none"> • Determine and protect sites through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5 •
Occupational safety and health concerns, including electrocution	<ul style="list-style-type: none"> • Adhere to stipulations of the OSHA 2007 during construction and operation • Use well trained (including in first aid) properly supervised and adequately insured workers during construction • Ensure use of PPEs during construction • Ensure use of properly maintained equipment • Use construction materials that meet stipulated standards • Ensure all the construction is done to specification and it is duly certified • Take special caution on building of bases to ensure the pylons are properly anchored on the

Potential negative impact	Mitigation measures
	<p>ground by approving each base individually by competent structural engineer</p> <ul style="list-style-type: none"> • Create public awareness on dangers of OHTL • Fix appropriate danger signage on each pylon and deter scaling of the pylon by use of razor /barbed wire to ring-fence the pylon about 10 feet from the ground • Supervise the way-leave at least once a year to maintain the way-leave devoid of any high vegetation • Ensure workers adhere strictly to provided safety precautions when undertaking any repairs and maintenance activities • Undertake drills on emergency preparedness in case of accidents • Monitor cases of accidents and near misses •
Risk to low flying planes	<ul style="list-style-type: none"> • Mark the wires to international standards to warn low flying planes •
Increased cases of vandalism	<ul style="list-style-type: none"> • Engage the public to report vandalism through use of manned hotlines • Rapid response to deter any reported cases of impeding vandalism • Consider use of advanced technology to deter vandalism by product modification or enhanced detection • Lobby the Government to elevate the crime of vandalism of electrical installation to the level of economic sabotage • Monitor number of attempted and accomplished vandalism
Fire outbreaks	<ul style="list-style-type: none"> • Maintain the way-leaves free of fire fuel • Partner with other agencies such as KWS and KFS in fire surveillance and fire fighting • Undertake regular fire drills • Monitor number of fire outbreaks

6.0. ENVIRONMENTAL, SOCIAL MANAGEMENT AND MONITORING PLAN

6.1 Overall ESMMP

Development of the environmental and social management plan and monitoring of impacts has been informed by all information obtained from document reviews, personal interviews as well as analysis of impacts. The essence of the ESMMP is to prepare and specify a road map for actions that need to be put in place to mitigate impacts arising from implementation all phases of the plan. It specifies actions to be taken to mitigate negative impacts a L-NE OHTL Project. Another feature of the plan is to amplify positive impacts as critical opportunities to be embraced by both proponent and public as well as negative impacts to guide mitigation and addressing for management and sustainability during construction and all other cycles of the project. In addition, the plan provides guidance on the time actions are to be taken while allocating responsibility. An estimate of how much it will cost to implement given activities is provided. Self-audits are included as part of the management and monitoring plan.

6.2 Internal monitoring

The proponent will conduct regular internal monitoring of the project to audit direct implementation of environmental mitigation measures contained in the ESMMP. The purpose of internal monitoring will be:

- Establish effectiveness and efficiency of the mitigations measures and as necessary take preventive and corrective actions
- Comply with requirements of EMCA 1999

Internal monitoring will include daily assessments and quarterly monitoring. KETRACO will create appropriate templates to report these different types of monitoring activities.

6.3 External monitoring

The proponent will subject the project to third party environmental auditors whenever its internal auditor detects major non conformities or in case of major unforeseen catastrophes. The proponent will also every year engage external auditors to prepare an environmental audit and submit the same to NEMA.

6.4 Monitoring of environmental performance

The ESMMP has identified specific performance parameters that will require specialist monitoring to detect changes that could be as a result of the project including the following:

- Biodiversity indices
- Sediment load in rivers
- Bird strikes
- Waste generated and redundant equipment
- Accidents and near misses

Table 15. Proposed Environmental and Social Impact Management and Monitoring Plan

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
Clearing of vegetation and loss of biodiversity	Negative	<ul style="list-style-type: none"> Compensate by planting of trees on roadsides and avenues and in other public places such as schools 	KETRACO	Operational phase	100,000 per year
		<ul style="list-style-type: none"> Undertake selective clearance to target only tall trees and shrubs and avoid clearance of short annual herbs 	KETRACO	Construction phase	-
		<ul style="list-style-type: none"> Adhere strictly to prescribed dimensions in clearing of vegetation 	KETRACO	Construction phase	-
		<ul style="list-style-type: none"> Monitor the biodiversity index over time in the project areas 	KETRACO's appointed agent such as KWS, KFS or KEFRI	Prior to commencement and twice year during wet and dry season	50,000 per year
Hazard to fauna including bird strikes	Negative	<ul style="list-style-type: none"> Desist from any form of hunting of game for trophies or food 	KETRACO staff or contracted agent	Construction, operation, decommissioning	
		<ul style="list-style-type: none"> Cart away any waste 	KETRACO staff or contracted agent	Construction, operation, decommissioning	10,000 per year
		<ul style="list-style-type: none"> Mark some of the wires to make them more visible 	KETRACO staff or contracted agent	Operation	Part of project budget-
		<ul style="list-style-type: none"> Erect perching platforms on top of pylons 	KETRACO or contracted agent	Operation	Part of project budget

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
		<ul style="list-style-type: none"> Monitor number of electrocuted birds and those lost to collision and compare with published data to made decision on effectiveness of measures taken 	KETRACO's appointed agent such as KWS, KFS or KEFRI	Operation	50,000 per year
Noise and dust pollution	Negative	<ul style="list-style-type: none"> Obtain necessary authorization if blasting is to take place 	KETRACO	Construction	-
		<ul style="list-style-type: none"> Provide appropriate PPEs to workers (dust masks and noise mufflers) 	KETRACO	Construction, operation, decommissioning	100,000
		<ul style="list-style-type: none"> Organise deliveries to avoid constant noise irritation and train workers on good practices of minimizing noise generation such as: turning off idle machines, avoiding hooting, gentle off-loading, use of properly maintained machines, and installation of mufflers on machinery 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> Next to settlements, restrict construction to daytime 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> Exercise discipline in areas next to schools and clinic 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> Deliver construction 	KETRACO or	Construction	-

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
		materials early in the morning when it is less windy and the materials are damp with dew	contracted agent		
		<ul style="list-style-type: none"> Use low speeds while delivering materials 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> In case of excessive dust, sprinkle materials and working areas with water 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> Supervise workers to ensure they work away from drifting dust 	KETRACO or contracted agent	Construction	-
Impeded drainage leading to soil erosion into water resources	Negative	<ul style="list-style-type: none"> Plan construction to coincide with dry weather 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> Minimize use of heavy equipment by favouring human labour 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> Avoid dragging of construction material on the ground to deter creating of soil erosion channels 	KETRACO or contracted agent	Construction	-
		<ul style="list-style-type: none"> In heavily compacted areas, such as lorry tracks, offloading sites and assembling points, disturb the soil, then mulch it to encourage quick plant regeneration 	KETRACO or contracted agent-	Construction	25,000

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
		<ul style="list-style-type: none"> Cut back the vegetation rather than outright clearance such that the soil is held by the stumps 	KETRACO or contracted agent	Construction and operation	-
		<ul style="list-style-type: none"> Do not disturb river banks whatsoever 	KETRACO or contracted agent	Construction and operation	-
		<ul style="list-style-type: none"> Use properly serviced equipment and take particular caution when working next to a river 	KETRACO or contracted agent	Construction and operation	-
		<ul style="list-style-type: none"> Sensitise workers not to dump any waste into rivers 	KETRACO or contracted agent	Construction, operation and decommissioning	-
		<ul style="list-style-type: none"> Monitor soil erosion levels and compare with published data for need to undertake additional corrective measures 	KETRACO or contracted agent	Operation	50000 per year
Solid waste generation	Negative	<ul style="list-style-type: none"> Proper quantification of requirements to avoid redundancies of ordered materials 	KETRACO	Prior to project commencement and during operation phase	-
		<ul style="list-style-type: none"> Use of high quality, long lasting and well maintained electrical equipment materials 	KETRACO	Prior to project commencement and during operation phase	-
		<ul style="list-style-type: none"> Segregation of solid wastes to encourage recycling / reuse at substations 	KETRACO	Construction and operational phase	10,000/year

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
		<ul style="list-style-type: none"> Monitor amount of waste generated per given period with a view of continuously reducing the waste generated 	KETRACO	Operational phase	-
Visual intrusion	Negative	<ul style="list-style-type: none"> Create public awareness before construction of pylons 	KETRACO	Prior to project commencement	10,000
		<ul style="list-style-type: none"> Where feasible use the hilly terrain to locate pylons in a way that will mask the visual intrusion 	KETRACO	Construction phase	-
Land acquisition and disruption of social economic setup	Negative	<ul style="list-style-type: none"> Implement a resettlement assessment plan 	KETRACO	Prior to project commencing	As per bid
		<ul style="list-style-type: none"> Civic education, public awareness, and sensitization on alternatives targeting where applicable both spouses 	KETRACO	Prior to project commencing	500,000
		<ul style="list-style-type: none"> Issuance of adequate notices 	KETRACO	Prior to project commencing	-
		<ul style="list-style-type: none"> Expedited compensation 	KETRACO	Prior to project commencing	As determined
Interference with cultural setup	Negative	<ul style="list-style-type: none"> Raise public awareness on the values of culture 	KETRACO	Prior to project commencing	
		<ul style="list-style-type: none"> Support social activities that promote the local cultures through the CSR avenues 	KETRACO	Operational phase	1,000,000 per year

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
Interference with cultural heritage		<ul style="list-style-type: none"> Determine and protect sites through a professional study as stipulated in The National Museums and Heritage Act of 2006, Section 5 	KETRACO	Prior to commencement	As per bid
Occupational safety and health concerns, including electrocution	Negative	<ul style="list-style-type: none"> Adhere to stipulations of the OSHA 2007 	KETRACO	Construction, operation and decommissioning	
		<ul style="list-style-type: none"> Use well trained (including in first aid) properly supervised and adequately insured workers 	KETRACO	Construction, operation and decommissioning	-
		<ul style="list-style-type: none"> Ensure use of PPEs 	KETRACO	Construction, operation and decommissioning	-
		<ul style="list-style-type: none"> Ensure use of properly maintained equipment 	KETRACO	Construction, operation and decommissioning	-
		<ul style="list-style-type: none"> Use construction materials that meet stipulated standards 	KETRACO	Construction	-
		<ul style="list-style-type: none"> Ensure all the construction is done to specification and it is duly certified 	KETRACO	Construction	-
		<ul style="list-style-type: none"> Take special caution on building of bases to ensure the pylons are properly 	KETRACO	Construction	-

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
		anchored on the ground by approving each base individually by competent structural engineer			
		<ul style="list-style-type: none"> Create public awareness on dangers of OHTL 	KETRACO	Construction, operation	-
		<ul style="list-style-type: none"> Fix appropriate danger signage on each pylon and deter scaling of the pylon by use of razor /barbed wire to ring-fence the pylon about 10 feet from the ground 	KETRACO	Construction, operation	-
		<ul style="list-style-type: none"> Supervise the way-leave at least once a year to maintain the way-leave devoid of any high vegetation 	KETRACO	Operation	250,000-
		<ul style="list-style-type: none"> Ensure workers adhere strictly to provided safety precautions when undertaking any repairs and maintenance activities 	KETRACO	Operation	-
		<ul style="list-style-type: none"> Undertake drills on emergency preparedness in case of accidents 	KETRACO	Construction, operation and decommissioning	50,000
		<ul style="list-style-type: none"> Monitor cases of accidents and near misses 	KETRACO	Construction, operation and decommissioning	

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
Risk to low flying planes	Negative	<ul style="list-style-type: none"> Mark the wires to international standards to warn low flying planes 	KETRACO or its agent	Construction	-
Increased cases of vandalism	Negative	<ul style="list-style-type: none"> Engage the public to report vandalism through use of manned hotlines 	KETRACO, Local administration	Operation phase	10,000 per year
		<ul style="list-style-type: none"> Rapid response to deter any reported cases of impeding vandalism 	KETRACO	Operation phase	50,000 per year
		<ul style="list-style-type: none"> Consider use of advanced technology to deter vandalism by product modification or enhanced detection 	KETRACO	Operation phase	50,000 per year
		<ul style="list-style-type: none"> Lobby the Government to elevate the crime of vandalism of electrical installation to the level of economic sabotage 	KETRACO	Operation phase	-
		<ul style="list-style-type: none"> Monitor number of attempted and accomplished vandalism 	KETRACO	Operation phase	-
Fire outbreaks	Negative	<ul style="list-style-type: none"> Maintain the way-leaves free of fire fuel 	KETRACO	At least once per year	50,000 per year
		<ul style="list-style-type: none"> Partner with other agencies such as KWS and KFS in fire surveillance and fire fighting 	KETRACO in partnership with KWS and KFS	Operation phase	30,000 per year
		<ul style="list-style-type: none"> Undertake regular fire drills 	KETRACO	At least once per year	50,000
		<ul style="list-style-type: none"> Monitor number of fire outbreaks 	KETRACO	Operation phase	-
Employment	Positive	<ul style="list-style-type: none"> Give first priority to local 	KETRACO	Construction and	-

Impact	Positive/ Negative	Mitigation / Enhancement measure/Monitoring element	Responsibility	Time frame	Mitigation costs (Kshs)
creation		member of public for all non-skilled work		operation phase	
Availability of electricity to households and increased connectivity	Positive	<ul style="list-style-type: none"> Start rural electrification project 	Rural Electrification Authority	Operation	-
Indicative Total Budget					

7.0. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusion

i. This EIA Report was initiated with full compliance with the National and International requirement of good practice in environmental management and control regarding electricity transmission project. The ANECT experts therefore, conducted a comprehensive environmental and social study in compliance with Legal and Policy requirements by NEMA and other legal agencies mandated by the Government of Kenya.

ii. Among other ESIA processes, the proponent through the EIA expert employed a comprehensive public participation and consultation to enlist public within the Lamu-Kitui-Nairobi East Transmission Line involvements in the management of the environmental monitoring and management during pre and post project implementation period within the framework of the Environmental Monitoring and Management Plan provided in this document.

iii. It is expected that the project will have limited impacts because it is localized to only small area (60 wide Meters) and also the transmission line itself traverses the areas of less biodiversity and natural resources asset as well as low human settlements.

iv. The proponent will provide an independent water source for the operation works and sanitation for workers involved during construction phase and restore back cleared vegetation and soil from excavation materials to original form.

v. The project is a priority and an important cog in realization of Vision 2030 aspirations;

vii. Proposed project will have significant long term social economic benefits nationally;

viii. Proposed project will have direct benefits to local communities during its implementation but deliberate efforts including other actors such as Rural Electrification Authority will be necessary to have the national benefits also accruing to locals;

ix. The overall environmental impacts of the project is low as due to the deliberate efforts that have been put in designing the route of the project which has avoided environmentally sensitive areas. The intensity of the impacts will be higher at the pylon construction sites. However, the visual intrusion will be permanent and hard to mitigate;

x. Although numerically the negative impacts are high, the real impact is low and easy to mitigate.

7.2. Recommendation

- i. KETRACO obtains all necessary certification and easements before implementation of the project;**
- ii. The National Environment Management Authority licenses the project for implementation;
- iii. The ESMMP be strictly adhered to protect the social and physical environment;

Annex 1: ESIA Study Team of Experts:

1. Dr. Alexander Kireria, PhD: Team Leader, ESIA Lead Expert
2. Mr. Bernard Kamondo MSc: Deputy Team Leader/EIA Lead Expert
3. Dr. John K. Mworio PhD: Ecologist
4. Dr. Hellen Nzainga, PhD: Socioeconomics
5. Mr. Sammy Kimani, BSc: Surveyor/ GIS Specialist Expert
6. Dr. Grace Muriithi, MPH: Public Health Expert
7. Mr. Kamu Nga'nga, BSc: Natural Resource Management Expert

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ANNEX 2: Species list and distribution

Species	OHTL SECTION						
	A	B	C	D	E	F	G
<i>Abutilon hirtum</i>	0	0	0	1	1	1	0
<i>Abutilon mauritianum</i>	1	0	0	0	1	1	0
<i>Acacia albida</i>	0	0	0	0	1	0	0
<i>Acacia brevispica</i>	1	1	0	0	0	0	1
<i>Acacia drepanolobium</i>	1	0	0	0	0	0	1
<i>Acacia elatior</i>	0	0	0	0	1	0	0
<i>Acacia horrid</i>	0	0	0	0	0	1	0
<i>Acacia indica</i>	0	0	0	0	0	1	0
<i>Acacia kirkii</i>	0	1	0	0	0	0	0
<i>Acacia melliphera</i>	1	1	0	0	0	1	0
<i>Acacia nilotica</i>	1	0	0	0	1	0	1
<i>Acacia nubica</i>	1	0	0	0	0	1	0
<i>Acacia polyacantha</i>	1	0	1	0	0	0	0
<i>Acacia reficiens</i>	0	0	0	1	0	0	0
<i>Acacia reiciens</i>	0	0	0	0	0	1	0
<i>Acacia robusta</i>	0	0	0	0	0	0	1
<i>Acacia seyal</i>	1	0	0	0	0	0	1
<i>Acacia stuhlmannii</i>	0	0	0	0	1	0	0
<i>Acacia tortilis</i>	1	1	0	0	0	0	0
<i>Acacia xanthophloea</i>	1	1	0	0	0	0	0
<i>Achyranthes aspera</i>	1	0	0	0	0	0	0
<i>Aerva javanica</i>	0	0	0	0	1	0	0
<i>Agape americana</i>	1	0	0	0	0	0	0
<i>Agave sisalana</i>	1	0	0	0	0	0	0
<i>Allophylus pervillei</i>	0	0	0	0	0	0	1
<i>Aloe secundiflora</i>	1	1	0	0	0	0	0
<i>Amaranthus quatzizens</i>	0	0	0	0	1	1	0
<i>Aristida nutabilis</i>	0	0	0	1	0	0	0
<i>Aristida sp</i>	1	0	0	0	0	0	0
<i>Arva lanata</i>	0	0	0	1	0	1	0
<i>Asparagus falcatus</i>	1	0	0	0	0	0	0
<i>Aspelia mossambicensis</i>	1	0	0	0	0	0	0
<i>Azadiradta indica</i>	1	0	0	0	0	0	0
<i>Balanites aegyoptica</i>	0	1	0	0	0	0	0
<i>Balanites aegyptiaca</i>	1	1	0	1	0	0	0
<i>Barleria acanthoides</i>	0	0	0	1	0	1	0
<i>Bauhinia variagata</i>	0	0	1	0	0	0	0
<i>Berleria acanthoides</i>	1	0	0	0	0	0	0
<i>Borassus aethiopum</i>	0	0	0	0	1	0	0
<i>Boscia angustifolia</i>	1	0	0	0	0	0	0
<i>Boscia coriacea</i>	0	0	0	1	0	1	0
<i>Brachiaria deflexa</i>	0	0	0	1	0	0	0

<i>Cadaba gladiosa</i>	0	0	0	1	0	0	0
<i>Cadaba rotundifolia</i>	0	0	0	0	0	1	0
<i>Cajanus cajan</i>	1	0	0	0	0	0	0
<i>Canjanus cajari</i>	0	0	1	0	0	0	0
<i>Canthium mombazense</i>	0	0	0	0	0	0	1
<i>Capparis tomentosa</i>	0	0	0	0	1	0	0
<i>Carissa tetramera</i>	0	0	0	0	0	0	1
<i>Cassia abbreviata</i>	1	0	0	0	0	0	0
<i>Casuarina glauca</i>	1	0	0	0	0	0	0
<i>Catunaregum nilotica</i>	0	0	0	0	0	0	1
<i>Cenchrus ciliaris</i>	1	0	0	0	0	1	0
<i>Chenchrus ciliaris</i>	0	0	0	1	0	0	0
<i>Chenopodium pumilio</i>	1	0	1	0	1	0	0
<i>Chloris roxburghiana</i>	0	1	0	0	0	0	0
<i>Chloris sp.</i>	1	0	0	0	0	0	0
<i>Circus rotundifolia</i>	0	0	0	1	0	0	0
<i>Cissus quadrangularis</i>	1	0	0	1	0	0	0
<i>Cissus rotundifolia</i>	1	0	0	0	1	1	0
<i>Cloris roxburghinnia</i>	0	1	0	0	0	0	0
<i>Coculus orlitolias</i>	0	0	0	0	0	1	0
<i>Combretum aculeatum</i>	0	0	0	0	1	0	1
<i>Combretum constrictum</i>	0	0	0	0	0	0	1
<i>Combretum molle</i>	1	1	0	0	0	0	0
<i>Combretum schumannii</i>	1	0	0	0	0	0	1
<i>Commelina benghalensis</i>	0	0	0	1	0	1	0
<i>Commiphora africana</i>	0	1	0	1	0	1	1
<i>Commiphora edulis</i>	1	0	0	0	0	0	0
<i>Corchorus olitorius</i>	0	0	0	1	0	0	0
<i>Cordia monoica</i>	0	0	0	1	0	1	0
<i>Cordia sinensis</i>	0	0	0	0	1	0	0
<i>Croton dichogamus</i>	0	0	0	0	0	1	0
<i>Croton macrostachyus</i>	0	0	1	0	0	0	0
<i>Croton menyhartii</i>	0	0	0	0	0	0	1
<i>Croton pseudopulchellus</i>	0	0	0	0	0	0	1
<i>Cucumis dipsaceus</i>	1	0	0	0	0	0	0
<i>Cucurbita ficifolia</i>	0	0	0	0	1	0	0
<i>Cyperus articulatus</i>	0	0	0	0	1	0	0
<i>Cyphostema sp</i>	0	0	0	0	1	0	0
<i>Cyprus sinensis</i>	1	0	0	0	0	0	0
<i>Dialium orientale</i>	0	0	0	0	0	0	1
<i>Dichrostachys cinerea</i>	0	0	0	0	0	0	1
<i>Digiterion macroblephera</i>	0	1	0	0	0	0	0
<i>Diospyros cornii</i>	0	0	0	0	0	0	1
<i>Dobera glabra</i>	1	0	0	1	0	1	1
<i>Duosperma erromophilum</i>	1	0	0	1	0	1	0
<i>Ehretia bakeri</i>	0	0	0	0	0	0	1
<i>Enteropogon sp</i>	0	0	0	1	1	1	0
<i>Eragrostis superba</i>	1	1	1	1	0	0	0

<i>Erva lanata</i>	1	0	0	0	0	0	0
<i>Eucalyptus teretecornis</i>	1	0	1	0	0	0	0
<i>Euclea divinorum</i>	1	0	0	0	0	0	0
<i>Euphobia heterochroma</i>	0	0	0	0	0	1	0
<i>Euphobia magnicapsula</i>	0	0	0	0	0	1	0
<i>Excoecaria madagascariensis</i>	0	0	0	0	1	0	0
<i>Ficus elastica</i>	1	0	0	0	0	0	0
<i>ficus sp</i>	0	0	0	0	1	0	0
<i>Ficus sycomorus</i>	0	0	1	0	0	0	0
<i>Flacourtia indica</i>	0	0	0	0	0	0	1
<i>Fluggea virosa</i>	0	0	0	0	0	0	1
<i>Garcinia livingstonei</i>	0	0	0	0	0	0	1
<i>Gnidia latifolia</i>	1	1	0	0	1	0	0
<i>Grevillea grandis</i>	1	0	0	0	0	0	0
<i>Grevillea robusta</i>	0	0	1	0	0	0	0
<i>Grewia bicolor</i>	0	0	0	1	0	0	0
<i>Grewia plagiophylla</i>	0	0	0	0	0	0	1
<i>Grewia similis</i>	1	0	0	0	0	1	0
<i>Grewia tenacs</i>	0	0	0	0	0	1	0
<i>Grewia tenax</i>	0	0	0	1	0	0	0
<i>Grewia villosa</i>	0	0	0	0	0	1	0
<i>Heinsia crinita</i>	0	0	0	0	0	0	1
<i>Helichrysum odoratissimum</i>	0	1	0	0	0	0	0
<i>Hibiscus aponeurus</i>	0	0	0	1	0	0	0
<i>Hoslundia opposita</i>	0	0	0	0	0	0	1
<i>Hyparrhenia rufa</i>	1	1	0	0	0	0	0
<i>Hyphaene compressa</i>	0	0	0	0	0	0	1
<i>Indigofera erracta</i>	0	0	0	0	0	1	0
<i>Indigofera errecta</i>	1	0	0	1	1	1	0
<i>Ipomoea kituensis</i>	0	1	0	0	0	0	0
<i>Lannea schweinfurthii</i>	0	0	0	0	0	0	1
<i>Lannea stuhlmannii</i>	0	0	0	0	0	0	1
<i>Lannea triphylla</i>	1	0	0	0	0	0	0
<i>Lannea welwitschii</i>	0	0	0	0	0	0	1
<i>Lantana camara</i>	1	0	1	0	0	0	0
<i>Lawsonia inermis</i>	0	0	0	0	0	0	1
<i>Lecaniodiscus fraxinifolius</i>	0	0	0	0	0	0	1
<i>Leudos grandis</i>	1	0	0	0	0	0	0
<i>Maerua kirkii</i>	0	0	0	0	1	0	0
<i>Maerua triphylla</i>	1	0	0	0	0	0	0
<i>Mangifera indica</i>	1	0	1	0	1	0	0
<i>Manilkara mochisia</i>	0	0	0	0	0	0	1
<i>Manilkara sulcata</i>	0	0	0	0	0	0	1
<i>Maytenus senegalensis</i>	1	1	0	0	0	0	0
<i>Monodora grandidieri</i>	0	0	0	0	0	0	1
<i>Mundulea sericea</i>	0	0	0	0	0	0	1
<i>Musa sapientum</i>	0	0	1	0	1	0	0

<i>Newtonia hildebrandtii</i>	0	0	0	0	0	0	1
<i>Ormocarpum kirkii</i>	0	0	0	0	0	0	1
<i>Osimum kilimandscharicum</i>	1	0	1	1	1	0	0
<i>Ozoroa obovata</i>	0	0	0	0	0	0	1
<i>Panicum sp</i>	0	0	0	0	1	0	0
<i>Parthenium hysterophorus</i>	1	0	0	0	0	0	0
<i>Phyllanthus sepialis</i>	0	0	0	0	1	0	0
<i>Plumbago zeylanica</i>	0	0	0	1	0	0	0
<i>Portulaca oleacea</i>	0	0	0	1	0	0	0
<i>Portulaca quadrifida</i>	0	0	0	0	0	1	0
<i>Potulaca quadrifida</i>	1	0	0	0	0	1	0
<i>Premna resinosa</i>	1	1	0	0	0	0	0
<i>Prosopis juliflora</i>	1	0	0	0	1	0	0
<i>Punica granatum</i>	0	0	0	0	0	1	0
<i>Rhochosia otta</i>	1	0	0	0	0	0	0
<i>Rhus natalensis</i>	1	1	0	0	0	0	0
<i>Ricinus communis</i>	0	0	0	0	1	0	0
<i>Ruellia patula</i>	0	0	0	1	0	0	0
<i>Salvadora persica</i>	0	0	0	0	0	1	1
<i>Sansevieria parva</i>	0	0	0	1	0	1	0
<i>Sansevieria robusta</i>	0	0	0	1	0	0	0
<i>Seddera hirsuta</i>	1	0	0	1	0	1	0
<i>Senna abbreviata</i>	1	0	1	0	0	0	0
<i>Senna spectabilis</i>	1	0	1	0	0	0	0
<i>Sida sp</i>	1	0	0	1	0	0	0
<i>Sideroxylon inerme</i>	0	0	0	0	0	0	1
<i>Solanum aculestrum</i>	1	0	0	0	0	0	0
<i>Solanum incanum</i>	1	0	0	1	0	1	0
<i>Solanum sp</i>	0	0	0	1	0	0	0
<i>Sonchus oleacea</i>	0	0	0	0	1	0	0
<i>Spathodea campanulata</i>	1	0	0	0	0	0	0
<i>Species</i>	0	0	0	0	0	0	1
<i>Sporobolus pyramidalis</i>	0	0	0	1	0	0	0
<i>Sterculia africana</i>	0	0	0	0	0	0	1
<i>Strychnos henningsii</i>	0	0	0	0	0	0	1
<i>Strychnos spinosa</i>	0	0	0	0	0	0	1
<i>Suregada zanzibariensis</i>	0	0	0	0	0	0	1
<i>Tagetes minuta</i>	1	0	0	0	0	0	0
<i>Tamarindus indica</i>	1	0	0	0	0	0	1
<i>Tapiphyllum schumannianum</i>	0	0	0	0	1	0	0
<i>Teclea trichocarpa</i>	0	0	0	0	0	0	1
<i>Terminalia brownii</i>	1	0	0	0	0	0	0
<i>Terminalia mentalis</i>	1	0	0	0	0	0	0
<i>Terminalia spinosa</i>	0	0	0	0	0	0	1
<i>Themeda triandra</i>	0	1	0	0	0	0	0
<i>Thespesia danis</i>	0	0	0	0	0	0	1
<i>Thylachium africanum</i>	0	0	0	0	1	0	0

<i>Tithonia diversifolia</i>	1	0	0	0	0	0	0
<i>Tribulus cistoides</i>	1	0	0	1	0	0	0
<i>Tribulus terrestris</i>	0	0	0	1	0	0	0
<i>Turraea mombassana</i>	0	0	0	0	1	0	0
<i>Vernonia cinerascens</i>	0	0	0	0	1	0	0
<i>Combretum zeyheri</i>	1	0	0	0	0	0	0
Grand Total	94	28	15	40	39	43	50
0= Absent, 1=Present							



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Confirmed by
[Signature]
SIMON M. MUMBU
EST. 1998

Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: MATHENI County: MACHAKOS Date: 11.8.2016

	Name	Id. Number	Contacts (Tel)	Signature
1	Simon J.D. Ojumu	7386695	0728 274056	[Signature]
2	Edward Kambella	0069174	079 3420 958	[Signature]
3	SAMUEL MUISYA MUI	10138863	071612644	[Signature]
4	Simon Muriuki Kiproti	1671379	0727151031	[Signature]
5	Aaron Nambua	12858683	0725 599052	[Signature]
6	Bonface I. Jaka	1203667	0701040935	[Signature]
7	DAVIS N. MAKAV	1457173	0727 996810	[Signature]
8	TITUS KICORZO	5263389	0727 777674	[Signature]
9	LAZARUS WAMBUA	2279520	0713628465	[Signature]
10	Anthony Musyoki	11203962	0701900131	[Signature]
11	RUBEN MUISYA	20076842	0719327361	[Signature]
12	RODAH MULINGE	13424234	0713858215	[Signature]
14	VERONICAH MUIINDA	29172403	0723865395	VERONICAH
15	Betty Mutei	4867443	0713927904	Betty
16	ROSKIA KAVULI MUGMA	7789499	0701386547	[Signature]
17	Paul Mwangangi	9922238	0717024055	[Signature]
18	MICHAEL M. MUTHOKI	7797458	0724190920	[Signature]
19	MARY WAIJA	13832596	0729622801	[Signature]
20	EMMANUEL KATIO MUTHENGI	26003666	0721377813	[Signature]
21	ABBIECCA MUGNI MUIHAI	21263685	0711481246	MUGNI
22	AGNES M. MUIVA	488208	0716443220	[Signature]
23	JAMES W. NGENYA	0360460	0710348368	[Signature]



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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: IKOMBE County: MACHAKOS Date: 12-8-2014

	Name	Id. Number	Contacts (Tel)	Signature
1	Baniel Mutisya	11203336	0701023833	<i>[Signature]</i>
2	Owesmus Nzile	3039482	0728548954	<i>[Signature]</i>
3	Gedion Mutua	1673164	070790702030090	<i>[Signature]</i>
4	Willy Kibiy			
5	Stokwag NZIOKI	7365368	0714152267	<i>[Signature]</i>
6	Mutungi Kimwela	22168204	0728287274	<i>[Signature]</i>
7	Ndeto Vutyo	1663742	0735228916	<i>[Signature]</i>
8	Joseph Mulel			
9	Kaumbuli Mutoka	6417183	0701817043	<i>[Signature]</i>
10	Kilbe Muambi			
11	Mary Murehe	0703197	0735426696	<i>[Signature]</i>
12	Kithika Mutoka	2152169		<i>[Signature]</i>
13	Tubyo Muli	0759855	0710530837	<i>[Signature]</i>
14	Kaviri Kiswala	5062305	0714396540	<i>[Signature]</i>
15	Festus Kimako	11162273	0729025562	<i>[Signature]</i>
16	Joseph Masila	0320218	0714266272	<i>[Signature]</i>
17	Talenta Solo	24252827	0720445983	<i>[Signature]</i>
18	Muhli Munguwa	493497	0710675453	<i>[Signature]</i>
19	Andrew Muli	7001885	0728-029805	<i>[Signature]</i>
20	Andrew Mhete	8925127	0719469132	<i>[Signature]</i>
21	Saving Mway	2992519	0702579559	<i>[Signature]</i>



Certificate



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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: SYOKITHUMBI County: KITUI Date: 12-8-2014

Name	Id. Number	Contacts (Tel)	Signature
Edward Kimani	1829692	0715764856	[Signature]
NZUE Maithya	13740527	0711218123	[Signature]
Francis Kimwe	20095349	0723175773	[Signature]
JOHN KISINGU	131340A	0711956461	[Signature]
Wambua Musyoka	3715922	0721815486	[Signature]
Paul Masika	4415695	0729314119	[Signature]
Patrick M. Nguthu	0272266	0701493724	[Signature]
Josphat M. Mairigi	0275109	0716126485	[Signature]
Wambua KIKUI			
Michael Ngure	3786370	0700749475	[Signature]
GAVEN-WAMBUA-MUTETI	0704200972		[Signature]
WAMBUA - KIKUI	2610770		W-KIKUI
MWANAKA SAMUEL	0725518550	0725518550	[Signature]
J. Ndlelwa Kyampanga	1452207	0707557424	[Signature]
James M. MASIKA	1368451	0713973238	[Signature]
Pius M. MAKUUE	1240500	0721894303	[Signature]
ANTONY M. MUTINDA	25733642	0712064374	[Signature]
JOHN MUKENDO	11425192	0708516662	[Signature]
PATRICK M. MBUTHIA	30585450	0703217356	[Signature]
RICHARD N. IKELI	11640768	0710846745	[Signature]
Dominic N KALWA	2428225	0713407320	[Signature]
Rhoda Thomas	25906144	0708291314	[Signature]
TELESIA KIVINDYO	9585541	0705213967	[Signature]
Reuben Mulandi	02703153	0710741557	[Signature]
KITHOME Kavila	6122843	0716613927	[Signature]



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Venue
A.I.C. Chumita

Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

Sub-loc. MWEMBE TAYARI

ATTENDANCY LIST.

Location: KYANIKA

County: KITUI

Date: 13.08.2014

Group.

	Name	Id. Number	Contacts (Tel)	Signature	
1	MUNYA MUSAILI	9072675	0725-116716	<i>[Signature]</i>	
2	Simon M. Wambua	21881437	0728070899	<i>[Signature]</i>	Youth
3	REYCANON KAMBA	3610303	0721288040	<i>[Signature]</i>	
4	Penninah Mwangi	3610660	0722251379	<i>[Signature]</i>	women
5	Lipah Philip	3610848	0722991165	<i>[Signature]</i>	women
6	Gladys M. Kilenzi	24005496	0720964867	<i>[Signature]</i>	women
7	Njuma Muisili	13592948	0711941417	<i>[Signature]</i>	Youth
8	Joseph Muiabe	3478412	0726338891	<i>[Signature]</i>	
9	Francis Mwangi	6273530	0728789915	<i>[Signature]</i>	
10	Daniel M Mwangi	2248158	0723499299	<i>[Signature]</i>	
11	REUBEN M KENGA	1146530	0724762572	<i>[Signature]</i>	
12	JULIANT N. MUMUKU	22213736	0707848554	<i>[Signature]</i>	Youth
13	Kalindi David	8631552	0725709663	<i>[Signature]</i>	women
14	Mary Kyalo	1147610	0724368821	<i>[Signature]</i>	women
15	Mwende Omani	1105060	0704782384	<i>[Signature]</i>	women
16	Muema Kilenzi	11520565	0722287657	<i>[Signature]</i>	
17	Elizabeth Kinjira	5393034		<i>[Signature]</i>	
18	ZIPPORA KATEE	11103495	0702840669	<i>[Signature]</i>	

[Signature]
BENARD M. KILONZI
ASST. CHIEF
MWEMBE TAYARI SUB-LOCATION
KYANIKA LOCATION
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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

Payment form.

Location: _____ County: _____ Date: _____

Name	Designation	Id. Number	Amount (Kshs)	Signature
THOMAS K MUTUA	CHIEF	20621304	500K	<i>[Signature]</i>
CHRISTINE M. KIOKO	ASST CHIEF	21256917	500K	<i>[Signature]</i>
BEN KIIONZO JOHN	ASST CHIEF	5710146	500K	<i>[Signature]</i>
Timothy Mazio	Elder	8509357	500K	<i>[Signature]</i>
Simon M. Nyamu	A/Chief	7386695	500K	<i>[Signature]</i>
JAMES W. NAEWA	PARA Chief	0360460	500K	<i>[Signature]</i>
ALINDE NI. MUTUA	CHIEF	488008	500K	<i>[Signature]</i>
ARON WAMBUA	elder	12858693	500K	<i>[Signature]</i>
BENJAMIN K. NZILE	CHIEF	3039062	500K	<i>[Signature]</i>
Julius Xi. Nuli	ASST chief	0759855	500K	<i>[Signature]</i>
SAMUEL M. MUTHEMBWA	"	11202336	500K	<i>[Signature]</i>
EDWARD MUIWA	CHIEF	11639365	500K	<i>[Signature]</i>
DANIEL KAWI	CHIEF	12647531	500K	<i>[Signature]</i>
EDWARD KIMANZI	SAC ASST CHIEF	1329692	500K	<i>[Signature]</i>
NZUE MATHYA	A/CHIEF	13740527	500K	<i>[Signature]</i>



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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: TIARA County: GARISSA Date: 15/08/2014

Name	Id. Number	Contacts (Tel)	Signature
ADEN SAHRE	11693873	0725658073	[Signature]
DEKON ALI	1132171	0703569727	[Signature]
Mohammed Omar	22737081	0729245137	[Signature]
Murshid Omar	13117202	0721870331	[Signature]
Hussain Omar	0000414	0914177369	[Signature]
Abdullahi T. Abdi			[Signature]
Noor Abikwe	9491277	071877402	[Signature]
Abdi Issack	1132040	0722165620	[Signature]
Muktar Jelle	1132084	0713065786	[Signature]
Ahmed Abdi	2460892	0729069968	[Signature]
Mohamed Jelle	20232760	0703299252	[Signature]
Abduss Abdi	25292306	0724708975	[Signature]
Hussain Jeleh	20876143	0704149744	[Signature]
Nawab Kayib	29651710	0726273717	[Signature]
Issack Digele	1132609	0729436444	[Signature]
Abdullahi Abdi			
Abdullahi Digele			
Murshid Digele	28049758	0728660558	[Signature]
Ruqa Hagi			
Nur Hassan	26082363	0720128032	[Signature]
Maha Ibrahim		0718773951	[Signature]
Binta Kadi			
Muhammad Kasir			
Hussain Jeleh			
Safi Baha			

Auled Aden 29270385 0722730142 [Signature]
 Souhar Hirab 3519569 0723626616 [Signature]
 Halima Ali 20239580
 Noor Karim 054
 Ali Hassan 30914134 0724384106 [Signature]
 Genya Bilow 0712791976 [Signature]

CHEIF, TIARA LOCATION



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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: WAYU County: TANA RIVER Date: 15/8/2014

	Name	Id. Number	Contacts (Tel)	Signature
1.	ABDULLA HUKICHA WARE	20232779	0722405936	[Signature]
2.	YAKUB ADAN UME	23766622	0724143259	[Signature]
3.	BODA GODANA SHAMBAZI	10310821	072409225	[Signature]
4.	ABDI TULICHA ABDULLA	20483221	0717056096	[Signature]
5.	OMAR KAMBURA BORU	0175696	0788815638	[Signature]
6.	HAMISI MOHAMMED ABDULLA	24110253		[Signature]
7.	BODA HASHAHO WAKO	5955230		[Signature]
8.	ALI GODANA SHAMBAZI	12729243	0738428550	[Signature]
9.	GURACHO BOKA BORU	10950830	0729698140	[Signature]
10.	DUBE DUDO MUTE	5375880	0720937647	[Signature]
11.	ADAN GUYO GALGALO	11659328	0726502356	[Signature]
12.	ISMAIL DIBO SHANGOLDI	23680900	0718614227	[Signature]
13.	ABUBAKAR GALGESA	23265891	0708668699	[Signature]
14.	ALIA KUSTACHU TAKWA	5955218		[Signature]
15.	ZAINAB ABDALLA UME	11889216		[Signature]
16.	MUHAMMED GALAND KUSTACHU	5479000		[Signature]
17.	FUNANI DIBO SHANGOLDI	23688613		[Signature]
18.	ALI MATHOMA GOLECHA	10311513		[Signature]
19.	AHMED ROBA HANTI	29506718	0703487094	[Signature]
20.	HAWE KOLDE KALKACHO	29508609	0738428550	[Signature]
21.	MUSA DIBO BUTE	23682422	0724235217	[Signature]
22.	ABDULLA GUYO GALGALO	0175666		[Signature]
23.	HASSAN MALAWO	21008921	NO	[Signature]
24.	TWALIBI JARG SUCUMBA	30219676	0725121537	[Signature]
25.	SAIDI DIBO BUTE			[Signature]

CHIEF
WAYU LOCATION
P.O. BOX 1 HOLA
 [Signature]
 Chief Ali Godana
 15/8/2014

ATTENDANCE

15/8/2014

	NAME	LOCATION	CONTACT	Signature
1.	MOHAMED A. DUOLK	CHIEF GUMARAY	0723595591	
2.	YASIN PARAH IBRAH	ASS/CHIEF MASALANI	0727948137	
3.	MUHAMMAD SAHAR	ASS/CHIEF M/DATHA	0710856578	
4.	MUASAR MOHAMMAD	MASALANI	0725152724	
5.	AHMED HASAN MOHAMMAD	MASALANI	0713326980	
6.	ABDUL KADIR ABDI	MASALANI	0729538690	
7.	SHARIF ANSARI	TORATOKA	0702208175	
8.	HUSSEIN MARUF	GUMARAY	0700417960	
9.	ABDULLAH KETANE	GUMARAY		
10.	RUSS OSMAN	GUMARAY	0728235492 0722541913	
11.	ABDI KIMOLKE	MASALANI	072256917	
12.	ABDUL HASAN JUMALE	MASALANI	0723807807	
13.	IBRAHIM DATHA DATHA	MASALANI	0721864752	
14.	KUSO OSMAN JUMALE	MASALANI		
15.	ROBIL NOUR	"	0716255547	
16.	SHARIF IMAN	"	0702995542	
17.	MOHAMMAD DATHA	"		
18.	^{HASAN} ABDULLAH JUSAR	"		
19.	^{ALI} MOHAMMAD ABDI	"		
20.	SHARIF HASAN	"	0717459359	
21.	IBRAHIM NESTER	GUMARAY	0777110703	
22.	HASAN SHARIF	GUMARAY		
23.	AHMED H. SHARIF	"	0702132576	
24.	YASIN MUTHIR	"	0727626212	
25.	AMIR SHAKIL	"	0724561742	
26.	MOHAMMAD A. SAMI	MASALANI	0705983680	
27.	SHARIF ABDI NABAR	GUMARAY	0722107598	
28.	^{AHMED} NOOR HUSSEIN NOOR	MASALANI	0713926338	
29.	ABDULLAH IBRAHIM	MASALANI	071674232	
30.	KHALIF YUSUF GUMARAY		0713330813	

ASS/CHIEF
PO BOX 1
MASALANI

[Signature]



African Nature &
Environmental Conservation Trust

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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: V-WALDENJA County: TAJA RIVER Date: 16/8/2014

Name	Id. Number	Contacts (Tel)	Signature
MAKA JAKO (MCA)	21004497	0722482796	<i>[Signature]</i>
MUHAMMAD A. HANJI	5375817	0700163639	<i>[Signature]</i>
WABE KUNYO SHONGOZO	8454145	0707869217	<i>[Signature]</i>
IBRAHIM ABDUB			
HUSSEIN B. FODHO	3923698		
HASSAN ABDULLA	25789391		
KASIM BARU			
MOHAMMED A. Golo	3924282		
NURA S. ZABORA	31390774		
ABDULLA D. Golo	3923923		
HUSSEIN B. ABASHEWU	29696960		
OMAR B. ABASHEWU	0954322		
ISACK K. Golo	23611343		
DAUD SAIDI	21249623		
AHMED B. HANI	26918015		
ALI K. LAKICHA	10310248		
ABDI I. GUTO	23472242		
MUHAMMAD GULED			
OMARI MUKOBAH	9267405		
ABI ABDULLA			
HAKKANO GUTO			
MOLU KOMPURE			
SUKAIMAN BORA			
NADHIRI ABDI			
HAKKANO G. ADII	21099727		

[Signature]

MUHAMMAD HANJI

ASST. CHIEF
TITILA SUB. LOCATION
DATE _____



African Nature &
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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: WALDIENA County: TANA - RIVER Date: 16/8/2014

Name	Id. Number	Contacts (Tel)	Signature
SARADHO G KUMBI	11 391747		
HUSSEIN GALZE	22 603274		
ISAACK A SHOKOZO	28143976		
AHMED A. ABARUFA	8267470		
USUMANA M' DIDA	8923916		
HUSSEIN M AKARAO	28130266		
MAMMUD C RASHUKA	31417415		
ABDIKABIR DIDO			
IBRAHIM HUSSEIN			
OMAR J BORU	21598843		
OMAR HUSSEIN			
HADIJA RACHE			
HAGANA DIDO			
HAGUDO JALDEJA			
TALAS HASSAN			
MUSHIMA AND			
HABIBA HUKA			
BERO DIDO			
MOHAMMED SOKA			
METUD GALGE			
GHUO AHINGO			
SULEIMAN SAIDI			
BARAZI JILO			
ISMAIL HUSSEIN			
IDRIS MUKUDU			

(Signature)

MOHAMED HANJI
ASST. CHIEF
TITILA SUB. LOCATION
DATE: -----



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ASST. CHIEF
BAROON SUB-LOCALITY

Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

Location: Hudi location ATTENDANCY LIST. County: Lamu Date: 18/8/2014

Name	Id. Number	Contacts (Tel)	Signature
Mohamed Abdillahi	27388916	0723314110	[Signature]
Abdalla Ba Sheve	29388908	0722360409	[Signature]
Abdellahi Shikiga	12969067	0727920128	[Signature]
Sheik Mohamed	08212656	0721801101	[Signature]
Tsun Mohamed	20800258	"	[Signature]
Omar Rashugi Matmud	01582380	0718194449	[Signature]
ALI ILEMA ABALOLA	0650927	"	[Signature]
SALATI KEMA BALOLA	0158219	"	[Signature]
Mohamed Somerswana	0655886	"	[Signature]
Mohamed Ali Mohamed	0650355	072574850	[Signature]
Ali Mohamed Hamis	0158221	0712815537	[Signature]
AHMED ISSAK Mohid	0208754	"	[Signature]
IRSHAD AHMED	1122120	"	[Signature]
ALI SENA Hamis	2239109	0724052730	[Signature]
Shungi Aballa	0158461	"	[Signature]
BATILA HUSSEIN	2114102	"	[Signature]
MARY MBEYU	24960165	"	[Signature]
RUKIA ABOALLA	31155296	"	[Signature]
FATIMA HUSSEIN	2239157	"	[Signature]
Halima GARANG	13536326	0725928992	[Signature]
Mohamed CHARO	"	0717658697	[Signature]
SAADA MOCTA	24303961	"	[Signature]
ALI ADAN GULED	29665758	0706013799	[Signature]
GURBA Mohamed	294303891	0728073216	[Signature]
OMAR CHIL	20160668	"	[Signature]

ASST. CHIEF
BAROON SUB-LOCALITY

ASST. CHIEF
BARGON SUB-LOCATION

Hindi location
Lamu County

DATE	Name	ID/NO	Telephone	Signature
	1 AMINA ABULI			
	2 ZANE MAJIBA MAZUM	32608034		
	3 KHADIJA OMAN			
	4 RHEMA ABDALLA	31701297		
	5 LAJU VAE	2091428		
	6 MAINUNA MADHEE	27860706		
	7 HALIMA LACHO			
	8 BINETI OMAN			
	9 MWANATOMA KACHU			
	10 TIMA VAE			
	11 MAMA MOCHO			
	12 ZAINABU WILI			
	13 HASILA KEDI	0650409		
	14 FETH MIKALI	20188975		
	15 SALAMA SHIFI	10680416		
	16 HAWO ABDI			
	17 FATUMA ABDI			
	18 BAHALI ABDI	32357992		
	19 RIKIA GUBI			
	20 UMAR MSUO	12229158		
	21 MARIAMA WEREKI	14537492		
	22 HABA HALIMA GIBANE			
	23 HALIMA MACHAKA			
	24 SARA MOCHO			
	25 AMINA ETABGUBA	20803126		
	26 HADIJA LALI	32608107		
	27 MARIAMU OMAN	202823125		
	28 NADHO GIBANE			
	29 MARIAM SALIM SUBO	220508216		
	30 FATUMA SALIM SUBO	8684033		
	31 HALIMA GUBE	26061210		
	32 ZENA JILO SANGO	10391058		
	33 AMINA JOLO SANGO	14537694		
	34 HABI BA MOLO BOYE	1239366		
	35 FATUNA ORPR MHADEE	20800723		

ASST. CHIEF
BAROTSI SUB-LOCATION

Hadi location
Lamu County

Date	Name	ID/NO.	Telephone	Signature
18/8/14	Jusef Hassan	8455189	0712251402	[Signature]
2	Athman Katara	25748885	-	
3	Badi Abdalla	9853110	07207844187	[Signature]
4	Mohamed Sultiman	21052220	-	
5	Sultan Bausi	-	-	
6	Simba Mazina	10391476	-	
7	Abuli Kerio	2239285	-	
8	Abadua Junang	2236342	-	
9	Haji Shidho	-	0708451689	[Signature]
10	Abdullahi Adhan	32350511	-	
11	Bliese Athman	0650940	-	Bliese
12	Aballa Ali	-	0729627616	
13	Chulla Gura	23500181	0705584133	
14	Ali Abass	26051084	-	
15	Ali Chero	-	-	
16	Abuli Guracho	-	-	
17	Saidi Ali	-	-	
18	Mohamed Mahras	-	-	
19	Mahat Elemu	-	-	
20	Solim Simba	-	-	
21	Dani Kedi	-	-	
22	Hussein Kunde	-	-	
23	Hassan Suleiman	-	-	
24	Makka Hahidi	-	0714236252	Makka
25	Abas Mohamed	-	0714236252	[Signature]
26	Ali Madhee	0158489	0723730064	[Signature]
27	Biza Doza	2239845	0719601852	[Signature]
28	Ali Buni	0850868	0703280738	[Signature]
29	Bausi Omar	-	-	
30	Eliud Sango	20244989	0702824926	[Signature]
31	Juma Ali	30365174	0728909195	[Signature]
32	Maddi Mander.	-	-	
33	Nickle Wambus	1064/128	071490504	[Signature]
34	Abdi Wore	-	-	
35	Abdalla Vae	-	-	
36	Abdullahi Lugumba	0164199	0700533305	[Signature]
37	Musa Kunde	-	0715236136	[Signature]

ASST. CHIEF
BAROTSI SUB-LOCATION



African Nature & Environmental Conservation Trust

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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.
 Location: Hindi - migejo County: Lamu Date: 19/8/2014

Name	Id. Number	Contacts (Tel)	Signature
Joseph yeri	3896347	0715758401	<i>Yeri</i>
FRANUS MWAURA	24966492	0707241840	<i>FRANUS</i>
Ali Bakari Mohamed	-	0724271719	<i>AL</i>
Kainu Katane	-	-	-
Muhammed thoya	-	-	-
Mohame ali haji	-	-	-
Rajabu Khara	-	-	-
Zodi Sekue	-	0729822164	<i>Zodi</i>
Charo waqye Ziro	-	-	-
Abudni mohamed	-	-	-
JOSPHAT K. MUTIKI	2203337	0722836744	<i>JOSPHAT</i>
CHARO THOYA	8454614	0708074065	<i>CHARO</i>
Omar Shukko	-	071217785	<i>Omar</i>
Haji fadhuluni	-	-	<i>Haji</i>
Mahid Ahmed mahid	-	0718109621	<i>Mahid</i>
Said Mahid Atwanan	-	-	X-X-X-
Sahre ali	-	-	CHAE
IBVRAHIMU	-	-	LUM
Dismas wanyaraka	247264874	070670884	<i>Dismas</i>
Margret Charo	-	-	X X X
Gasama salim	21238412	0702870743	<i>Gasama</i>
Abdulkadir Ahamed	-	-	-
Omar ali	-	-	<i>Omar</i>
Khabwab Faruk	-	0713542399	<i>Khabwab</i>
Mussa Shee	-	0704955933	MUSA



African Nature & Environmental Conservation Trust

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Consultancy Services for Carrying out Environmental and Social Impact Assessment (ESIA) for the proposed transmission Line 520KM, 400 KV Double Circuit Line from Nairobi-East-Kitui-Lamu

ATTENDANCY LIST.

Location: Hindi - Magogod County: Lamu Date: 19/8/2014

Name	Id. Number	Contacts (Tel)	Signature
ANWAR OMAR	26580451	0714235557	
Imanuel mtawali	-	-	
Samuel Chero	29665554	0707230103	
John Immanuel	13019767	0708879912	
David Muriuki	-	0733767898	
Joseph Kamau	-	07337657898	
Omar mfondera	21072925	07- - -	
ABU DIBAMU	30906898	- - -	
Amani Chero	- - -	- - -	XXX
Mwalimu Ngumbao	31999209	- - -	
HALIMA KIBUANA	23337899	0722204782	
HAMMO WAZIRI	-	0725250600	
Omar Shahali	0651307	- - -	
Omar NGUMBAO	- - -	- - -	
Nassir Mohamed	- - -	- - -	
ABU Bakari	- - -	- - -	XXX
Kasungu Mwanjao	- - -	- - -	XXX
Aome Nyenge	3368400	0716258473	
Kalambi Mubembe	-	0705588701	XXX
Bataka DUME	-	07258473	
Bakari Ali	- - -	- - -	XXX
Abdalla Saidi	-	-	

Annex 3: Views submitted in writing

2. - STAKEHOLDERS FEEDBACK FORM -

Please fill this form to provide your comment/inputs on the proposed project and return to the ESIA Consultant on the address or email provided on the first page of this letter. You may also submit a written comment if necessary

Name THOMAS K MUTUA

Organization _____

Designation/position CHIEF - KOMAROCK LOC

Contact Details	Address	Phone	Email address
0726170428	Box 603 TALA		

Signature  Date 11-8-2014

Stamp:
CHIEF: KOMAROCK
LOCATION
P.O. BOX 124
TALA

Please write your Comment below:

- The community have appreciated of the proposed project
- They have accepted the project and agreed to support it fully. They have requested for more education on how to utilize funds after compensation.

CHRISTINE M. KIOKO
ASST
ASST-CHIEF
MUKENGESYA SUB-LOC
KOMAROCK-LOC
P.O. Box 550 TALA 

2. STAKEHOLDERS FEEDBACK FORM

Please fill this form to provide your comment/inputs on the proposed project and return to the ESIA Consultant on the address or email provided on the first page of this letter. You may also submit a written comment if necessary

Name DANIEL MUGISHA MUSHEMBWA

Organization MINISTRY OF INTERIOR COORDINATION OF REGIONAL GOVERNMENTS

Designation/position ASSISTANT CHIEF

Contact Details	Address	Phone	Email address
0732556620	P.O BOX 140 MATUU		

Signature [Signature] Date 12.8.2014

Stamp:

Please write your Comment below:

The community are willing on the new system of power installation and it will assist on institutions, markets, dispensary and individuals.

HB people request for work to start immediately and also want facilitators



Certified

2. **STAKEHOLDERS FEEDBACK FORM**

Please fill this form to provide your comment/inputs on the proposed project and return to the ESIA Consultant on the address or email provided on the first page of this letter. You may also submit a written comment if necessary

Name PATRICIA N. MAINA
 Organization KENYA FOREST SERVICE -
 Designation/position FORESTWARD

Contact Details	Address	Phone	Email address
	Box 49 - Lamu	0120282549	kfskenya@gmail.com kfskenya@yahoo.com

Signature [Signature] Date 27/08/2014

Stamp:



Please write your Comment below:

An E.I.A has to be done.
 Pay for wayleave as the line will pass through
 a public forest - (Boni Wajji). This has to be with
 consultation from the Director, Kenya Forest Service -
 Nairobi

ANNEX 4: ESIA QUESTIONNAIRE



Rasi Gardens Hurlingham P.O.Box: 54250 - 00200, Tel: +254 20 2730862, Fax: 2730862,
Cell: 0722 745 828 / 0733 207 030, E-mail: info@africanature.org, www.africanature.org

ESIA QUESTIONNAIRES

PROPOSED LAMU-KITUI-NAIROBI-EAST 400 KV POWER TRANSMISSION LINE

2nd August, 2014

To:

**RE: Environmental and Social Impact Assessment (ESIA)
For 520 Km, 400 KV Double Circuit Transmission Line From
Nairobi East- Kitui- Lamu**

The Kenya Electricity Transmission Company Ltd (KETRACO) proposes to construct a 400 KV Double Circuit Transmission Line (TL) covering: Nairobi East- Kitui- Lamu a distance of approximately 520 Kilometres. Subsequently, KETRACO has commissioned the African Nature & Environmental Conservation Trust (**ANECT Group**) to undertake an Environmental and Social Impact Assessment (ESIA) on the project between August - September 2014.

The purpose of this letter is to kindly request you to provide your opinion, views and or information on possible impact that in your view, the project may pose with regard to: environmental, ecological, socioeconomics, socio-cultural setting or any other issues of importance.

Please fill in the attached Stakeholders Feedback Form (page 3 of this letter) and return to the undersigned as soon as convenient.

Yours Sincerely,

Alexander Kireria
Team Leader/Lead Environmental
ANECT Group
P.O. Box 54250-00200
Tel: 0722745828

1. BACKGROUND

The Government of Kenya plans to increase access to electricity in Kenya tenfold from the current 4% in the rural areas to about 40% by 2020. The proposed 520km, 400kV double circuit transmission lines are part of the 5000+ megawatts project that the Government has promised to deliver as one of propriety flagship project towards meeting the Vision 2030 on energy sector.

The proposed Nairobi-East-Kitui-Lamu Transmission lines will improve reliability, increase access to electricity and improve power quality in Project areas and other parts of the country.

1.1. OBJECTIVE OF THE ESIA STUDY

The objective of the study is to carry out detailed Environmental and Social Impact Assessment (ESIA) for the proposed transmission lines.

The main objective of the ESIA will be to identify significant environmental and social impacts associated with the proposed projects and recommend appropriate mitigation measures for integration in all phases of the projects cycle. The ESIA will generate an Environmental Management Plan that describes in detail the mitigation measures to be carried out, the costing, scheduling and responsibility of such measures, and a detailed monitoring process and its schedule.

Specifically, the ESIA will identify and assess all the positive and negative environmental and social impacts that are likely to be generated and develop mitigation plans of action for addressing during implementation phase of the project.

The ESIA study is a participatory and consultative process that requires participation of stakeholders and public along the project areas in view of gathering a comprehensive scoping of key environmental and social issues that might affect the design of the different options including identification and analysis of potential key direct and indirect impacts of the Project, environmental and social conditions in the potentially affected areas.

Examples of the baseline environmental and social data and information will be examined and assessed within the scope and framework of the ESIA Study:

- General Baseline information on the environmental characteristics of the existing situation and possible impacts on the following:
- *Physical environment* (topography, landforms, geology, soils climate and meteorology, air quality, hydrology, etc.);
- *Biological environment* (i.e., flora and fauna types and diversity, endangered species, sensitive habitats, marine etc.);
- *Social and cultural environment*, (i.e., population, land use, planned development activities, community structure, employment and labour market, sources and distribution of income, cultural properties, etc).

2. STAKEHOLDERS FEEDBACK FORM

Please fill this form to provide your comment/inputs on the proposed project and return to the ESIA Consultant on the address or email provided on the first page of this letter. You may also submit a written comment if necessary

Name_____

Organization_____

Designation/position_____

Contact Details	Address	Phone	Email address

Signature_____Date_____

Stamp:

Please write your Comment below:

Name of respondent:-----

Contact address.....

Telephone.....ID.....

Geographical and Administrative Unit

County-----

Sub-County-----

Location/Ward-----

Sub-Location-----

Village-----

A. Baseline Biophysical and Social Conditions

General Description of the Area	Description Size/Quantity	Yes ()	No ()		
Location					
Topography and drainage					
Climate					
Rainfall					
Temperature and evapo-transpiration					
Geology and Soils					
Transport					
Types of Biodiversity:					
i.					
ii.					
iii.					
iv.					
v.					
Hydrology and surface water					
Wetlands					
World Heritage Sites					
Forest					
Conservation area					

B. Socioeconomics Issues

Name of Respondent.....
Position.....
ID No.....Contact address.....
Area and Location
Occupation:.....

Population distribution/Density					
Size of household					
Human Settlement					
Population					
Households					
Utility:					
i. source and type of energy					
ii. communication					
iii. water					
iv. transport					
Health facility					
Land use and tenure					
i. freehold					
ii. Communal Land					
iii. Government					
Description of types of Livelihood activities:					
i.					
ii.					
iii.					
Agriculture: Type of farming:					
I					
Ii					
iii					
iv.					
Others					
Livestock production by type					
i. Cattle					
Ii. Sheep and goats					
iii. camel					
iv. Poultry					
v. Others					
Tourism					
Business enterprises					
Cultural and Historical heritage					
Health and Sanitation					
i. Common diseases					
ii. Access to health facility					
iii. Exposure and vulnerability to: Malaria HIV/AIDS TB Other diseases					

BIOPHYSICAL DATA COLLECTION GUIDE
VEGETATION TYPE CLASSIFICATION (Pratt and Gywne)

Vegetation type	Description
a Bushland	Land supporting an assemblage of trees and shrubs with a single layered canopy <10m. Canopy cover greater than 20%.
b woodland	Land supporting a stand of trees, up to 20m in with an open or continuous but not thickly interlaced canopy with cover greater than 20%.
c Shrubland	Land supporting a stand of shrubs usually not exceeding 6m in height, ground cover is poor, canopy cover>20%
d Bush grassland	This is a grassland with scattered or grouped shrubs which have a cover of less than 20%.
e Wooded grassland	This is a grassland with scattered or grouped trees with canopy of less than 20%. In figure above 2 sub-types are shown one with tall grass and other short grass.
f Dwarf shrub grassland	Grassland set with dwarf shrubs not exceeding 70cm in height sometimes with widely scattered larger shrubs. This type of plant formation is arid regions mainly in North Kenya.

ECO-CLIMATIC ZONATION

Eco-climatic zone	Climax vegetation and land-use
I (Afroalpine)	Moorland and grassland, used for tourism
II (Tropical climate)	Forests and derived grasslands –suitable for intensive agriculture
III (Dry sub-humid to semi-arid)	Moist woodland, bushland or savanna. The trees are mainly <i>Brachystegia</i> and <i>Combretum</i> . Land not of forest potential but of high agricultural potential (e.g. wheat farms). Very high livestock potential
IV (semi-arid)	Dry forms of woodland or savanna often with <i>Acacia</i> trees associated with <i>Themeda triadra</i> grass. Marginal agricultural potential but high wildlife and livestock density, hence high tourism potential.
V (Arid)	Dominated by <i>Commiphora</i> , <i>Acacia</i> and other shrub species while grasses are <i>Cenchrus ciliaris</i> and <i>Chloris roxburghiana</i> . Land not suitable for agriculture used mainly by livestock and wildlife.
VI (Very arid)	Dwarf shrub greassland and shrub grassland mainly <i>Acacia reficiens</i> confined to water courses with main perennial grass being <i>Chrysopogon aucheri</i> , however dominated by annual grasses.

SOIL EROSION CLASSES (Lal 1990):

Class	Description

1	No apparent or slight erosion
2	Moderate erosion, moderate loss of topsoil generally and/or some dissection by runoff channels
3	Severe erosion, severe loss of topsoil generally and/or marked dissection by runoff channels or gullies
4	Very severe erosion. Complete truncation of the soil profile and exposure of subsoil (B horizon) and/or deep and intricate dissection by runoff channels or gullies